FLEA NEWS is a biannual newsletter about fleas (Siphonaptera). Recipients are urged to check any citations given here before including them in publications. Many of our sources are abstracting journals and current literature sources such as National Agricultural Library (NAL) Agricola, and National Library of Medicine (NLM) Medline, and citations have not necessarily been checked for accuracy or consistent formatting.

Recipients are urged to contribute items of interest to the profession for inclusion herein, including: Flea research citations from journals that are not indexed in Agricola or Medline databases, Announcements and Requests for material, Contact information for a Directory of Siphonapterists (name, mailing address, email address, and areas of interest - Systematics, Ecology, Control, etc.), Abstracts of research planned or in progress, Book reviews, Biography, Hypotheses and Literature Reviews, and Anecdotes. Send to:

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Organizers of the Flea News Network are Drs. R. L. Bossard and N. C. Hinkle.

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Editorial

Dear Flea News Reader,

Pithily synopsizing the hundreds of citations of investigations on fleas (Siphonaptera) listed in every volume of *Flea News* would be hard; see the 'Featured Research' section of *Flea News* for a few highlights.

Nonetheless, we can report that new flea species are being found and described, though slower than in times past.

Flea-borne pathogens and diseases, especially plague, both historical and current, remains fascinating: Hufthammer and Walløe (2013) show we do not understand plague transmission during the medieval age.

Fossils (Gao et al. 2012, Huang et al. 2012, 2013) and new findings in anatomy (Friedrich et al. 2013) bolster similarities between Mecopterans (scorpion flies) and Siphonapterans - large fleas infested mammals and dinosaurs in the Mesozoic; Mecopterans are complex, and similar to several insect orders such as Diptera; more than entomologists comprehended.

Knowledge of fleas at the family, and lower, levels is evolving rapidly, but our understanding of the life histories of fleas seems lacking.

Investigations of biomes and habitats are revealing characteristic assemblages of fleas, mites, and other parasites, and microbial symbiotes.

In short, fleas remain a rapidly developing area of research!

Thanks to Jim Kucera and Christine McCoy for assisting with the editing, and everyone who sent me items for inclusion.

Yours in Fleas,
R.L. Bossard
Editor, Flea News
Announcements

New Doctoral Dissertations

Student: Juliana P. Sanchez
Director: Marcela Lareschi
Title: Sifonápteros ectoparásitos de los roedores sigmodontinos de la Patagonia norte de Argentina: estudios sistemáticos y ecológicos. University of La Plata, Argentina. March 1st, 2013. [Siphonapteran ectoparasites of sigmodontine rodents from Northern Patagonia, Argentina: Systematic and ecological studies.]


In this thesis we studied the diversity of fleas of rodent sigmodontine of the Chubut Province (Northern Patagonia, Argentina) with emphasis systematics and to interpret the parasite-host-environment relationships. Were identified 16 species and subspecies of fleas (families Ctenophthalmidae, Stephanocircidae, Tungidae and Rhopalopsyllidae), parasites of 13 species of sigmodontine rodents from Monte and Estepa Patagónica of the Chubut Province. Two new species to science were discovered (Ctenophthalmidae: Neotyphloceras n. sp. 1 and Neotyphloceras n. sp. 2) and five species and subspecies were redescribed (Stephanocircidae: Tiarapsylla argentina, Plocopsylla wilesi, Plocopsylla silewi and Ctenophthalmidae: Agastopsylla boxi boxi and Neotyphloceras chilensis nov. comb.). New characteristics of diagnostic importance for the genus Neotyphloceras were provided and used to identify females of the subspecies of the genus, Neotyphloceras chilensis nov. comb. was raised to species level, and it was proposed the existence of "Neotyphloceras species group". For the majority of the fleas identified in this thesis, new geographical and/or host records were reported. Moreover, quantitative analyzes were performed to component and compound community level. To the compound community level, the Estepa Árida showed the highest values of parasitological indexes. To the component community level, the greatest richness of Siphonaptera was obtained in rodent with greater geographic distribution. The comparison between flea communities of every host population resulted in greater similarity among species of sympatric rodents than among congeneric rodents. The results highlight the influence of environmental conditions of the region on the richness and prevalence of Siphonaptera, observing higher values of both indices in Patagonia compared with other regions of Argentina. Related to the relationship of the Siphonaptera with their hosts, the present results reflect that these parasites are specific of Sigmodontinae. However, the species and subspecies identified didn’t show, in general, specificity to genus and host species; higher prevalences were registered in hosts more widely represented in each eco-region. Moreover, for most of the Siphonaptera the
association patterns with its hosts were not maintained along the geographical
distribution of the latter, highlighting the influence of environmental characteristics
associated with each eco-region.

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Student: María Cecilia Ezquiaga
Title: PARASITOLOGICAL STUDIES ON DASYPODIDAE (MAMMALIA,
XENARTHRA) FROM ARGENTINA: THE VALUE OF THE DIVERSITY IN
THE INTERPRETATION OF THE ASSOCIATIONS PARASITE-HOST-
ENVIRONMENT.

Doctoral dissertation (235 pp.) in Natural Sciences defended on March 13, 2013
by María Cecilia Ezquiaga <cecilia@cepave.edu.ar>. Place: Facultad de Ciencias
Naturales y Museo, Universidad Nacional de La Plata, La Plata, Argentina. Advisors:
Graciela Navone and Marcela Lareschi. Committee members: Juan Timi, Celina Digiani
and Guillermo Denegri.

The aim of this study was to characterize the parasitological fauna (helminthes
and arthropods) from four species of Dasypodidae, taking into account the geographic
and / or phylogenetic distances. This was achieved with communities of parasites from a
population of *Chaetophractus vellerosus* core and another one isolated in the east of
Buenos Aires province, and with a population of *Chaetophractus villosus* in its core
distribution and in a population from Tierra del Fuego. It was also studied parasite
communities from *Zaedyus pichiy* and *Dasypus hybridus*, selected as model species for
their diet behavior and geographical distribution. Eight species of arthropod parasites
(fleas, mites and ticks), 13 species of nematodes, one cestode and one acanthocephalan
were identified, of which host range and geographical distribution were expanded. The
results of this study show that there is a group of species that are characteristic of
dasipodids, which go along their distribution independent from environmental
characteristics, and confirm that when populations are isolated, they have lower diversity
of species.

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Here is a list of all the flea-related presentations at the 12th International
Symposium on Ectoparasites of Pets, held in Munich, Germany, April 7-10, 2013. The
crowd was mostly Europeans, but about a dozen attended from the U.S.

**Efficacy testing with topically applied pet products and impregnated collars for the
control of ectoparasites on dogs and cats – test methods, designs and evaluations;**
*K. J. Sweeney*

**Laboratory evaluations of the repellent activity of selected compounds against
haematophagous arthropods;**
*W. A. Donahue Jr.*, B. E. Vinson, S. De La Vega, M. W. Donahue
Fleas and flea-borne pathogens in pets;
M. Franc

Cat flea susceptibility to Imidacloprid: Results of a 11-year monitoring initiative;

Preventive efficacy of Frontline® Combo and Certifect® against *Dipylidium caninum* infestations of cats and dogs using a natural flea (*Ctenocephalides felis*) infestation model;
F. Beugnet, P. C. Delport, H. G. Luus, D. Crafford, J. Fourie

The characteristics of flea infestation in cats: results from a 3 year period in the Dermatology/Parasitology Clinics of the Veterinary School of Nantes (ONIRIS);
P. Bourdeau, L. Imparato, V. Bruet, C. Clement

Ectoparasite fauna of cats from Tirana, Albania;
M. Knaus, E. Shukullari, D. Rapti, R. Postoli, D. Xhaxhiu, M. Visser, R. Winter, S. Rehbein

Molecular detection of pathogens in ticks and fleas infesting dogs in Albania;
C. Silaghi, M. Knaus, D. Hamel, D. Rapti, K. Pfister, S. Rehbein

Efficacy of dinotefuran, permethrin and pyriproxfen combination spot-on on dogs against *Phlebotomus perniciosus* and on *Ctenocephalides canis*;
E. Bouhsira, E. Liénard, P. Jacquet, S. Warin, V. Kaltsatos, M. Franc

The complete program is available on-line at http://www.isep2013.net/.

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The 6th International Congress of Vector Ecology will be held in Palm Springs, CA, September 22-27, 2013. Presentations dealing with flea biology, ecology, control, and disease transmission are appropriate for submission.

Topics include Integrated Vector Management, Attractants/Repellents, Trapping, Zoonotic Diseases, and a dozen other symposia. Posters are also being solicited.

Don’t forget to register and make reservations to attend this year’s SOVE International Congress. Questions can be directed to the program chair, Gregory Lanzaro (gclanzaro@ucdavis.edu). More information is at the website http://www.sove.org/Society_for_Vector_Ecology/Home.html

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Research in Progress

The Artificial Dog
(continuing discussion from Flea News, Vol. 71 December 2012)

Hello Everyone,

I have been using the artificial dog for many years using either bovine or porcine blood and the Parafilm membrane. I have 3 different systems and they all perform fairly well with cat fleas using either type of blood as long as there are no contaminants. For almost all of my work I used cat-reared adult fleas placed directly on the membrane systems for bioassays (IGRs and insecticides) with good success. I used the strain of fleas from my days at Zoecon as well as the strain I started here at Sierra Research Labs almost 20 years ago. I would get good feeding and egg production although as Nancy Hinkle mentioned the efficiency was dramatically lower than with live hosts (i.e. cats). Flea hatch rates and survival were identical for cat-reared or membrane-reared fleas. I found out that frozen blood does not work well for fleas on the artificial system and only use fresh, citrated blood. Approximately every 2 years I will collect cat fleas from field locations and infuse them into my colony (Modesto Wild). Over the years I supplied Jay Georgi with fleas from my colony because he said his fleas were getting "wimpy" and wanted a little more vigor in the strain. He never mentioned any great difficulty in adapting or adding these fleas to his colonies and I don't know any of the details regarding his methods. I don't know if anyone maintains Georgi's strain, but historically a lot of flea colonies are hybrids from different labs or field collections, especially when a colony "crashes".

This year I had a project to evaluate systemic insecticides for adult flea control and was using Georgi's artificial dog (the one with 108 feeders). I added fleas from my Modesto Wild colony to the feeders and I could not get them to feed at all! I tried my 2 other systems and I got the same results. This was the first time my cat-reared fleas would not feed to any extent on the artificial systems. I contacted Glenn Cawthorne at EctoServices and he sent me some of his artificially-reared fleas and they fed well on all 3 of my systems with excellent egg production and survival. I ended up using his fleas on the systemic insecticide project and all worked well. Glenn infused Modesto Wild fleas into his strain several years ago and said it was pretty difficult to get them started.

I had just brought in all new cats (5) for my flea-rearing colony last year (2011), these were young animals with existing flea infestations. The fleas produced by these cats are very healthy and vigorous, and I added the offspring to the existing Modesto Wild colony. I use these for in vitro insecticide evaluations, and they are a very hardy "field" strain, but I have not screened them for insecticide resistance recently. Because these fleas were so recently collected and added to the Modesto Wild strain they may be harder to adapt to the membrane systems than fleas that had been in colony for a while. There may be something different in their genetic make-up compared with fleas I obtained in the past, even though they are all from the same proximity to Modesto.
I hope this helps, please feel to contact me at any time.

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Editor's note: A host-less (in vitro) system for feeding adult fleas was patented under United States Patent 5133289 by Jay R. Georgi on July 28, 1992. - R.L. Bossard

"Artificial system and method for breeding fleas

A system for breeding fleas comprises a blood reservoir with a feeding membrane and a cage adjacent to the feeding membrane and containing a screen which supports the fleas during feeding, divides the cage into a feeding chamber and an egg collection chamber and provides access by the fleas between these chambers. The fleas are confined in the cage and stand on the screen to feed by penetrating the membrane with their mouth parts to obtain blood from the reservoir. The access between the feeding and egg collection chambers allows the cage to contain more fleas than if such access were not provided and open interiors of the feeding and egg collection chambers allow easy cleaning and egg collection."

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Revised List of the Siphonaptera of Utah, USA

by James R. Kucera
jameskucera@aol.com

This list is revised from that of H. Stark (1958), The Siphonaptera of Utah (U.S. Department of Health, Education and Welfare, PHS). Fifty plus years of literature have led to many changes, but the main sources were those of R.E. Lewis (1972, 1974a, 1974b, 1975), Lewis & Lewis (1985), The Rothschild Catalogues of Fleas in the British Museum, and Smit (1982). It is surely incomplete and should be viewed as a work in-progress; feedback is welcomed. Harold Egoscue (deceased) made helpful comments on an earlier version.
Hystrichopsylloidea

Hystrichopsyllidae

Hystrichopsyllinae
Hystrichopsylla dippiei truncata  Holland, 1957
Hystrichopsylla occidentalis sylvaticus  Campos & Stark, 1979
Atyphloceras multidentatus multidentatus  (C. Fox, 1909)
Atyphloceras echis echis  Jordan & Rothschild, 1915

Ctenophthalmidae

Rhadinopsyllinae
Rhadinopsylla (Actenophthalmus) heiseri  (McCoy, 1911)
Rhadinopsylla (Actenophthalmus) fraterna  (Baker, 1895)
Rhadinopsylla (Micropsylla) sectilis goodi  (Hubbard, 1941)
Nearctopsylla hyrtaci  (Rothschild, 1904)
Nearctopsylla brooksi  (Rothschild, 1904)

Doratopsyllinae
Corrodopsylla curvata curvata  (Rothschild, 1915)
Corrodopsylla curvata obtusata  Wagner, 1929

Ctenophthalminae
Ctenophthalmus pseudagyrtes pseudagyrtes  Baker, 1904
Carteretta clavata  Good, 1942

Neopsyllinae
Neopsylla inopina  Rothschild, 1915
Phalacropsylla allos  Wagner, 1936
Meringis dipodomys  Kohls, 1938
Meringis parkeri  Jordan, 1937
Meringis hubbardi  Kohls, 1938
Epitedia scapani  (Wagner, 1936)
Epitedia wenmanni wenmanni  (Rothschild, 1904)
Epitedia wenmanni testor  (Rothschild, 1915)
Epitedia stanfordi  Traub, 1944
Catallagia decipiens  Rothschild, 1915
Catallagia neweyi  Holland & Loshbaugh, 1958
Delotelis telegoni  (Rothschild, 1905)

Anomiopsyllinae
Callistopsyllus terinus  (Rothschild, 1905)
Megarthroglossus procos  Jordan & Rothschild, 1915
Megarthroglossus becki  Tipton & Allred, 1951
Megarthroglossus divisus divisus  (Baker, 1898)
Megarthroglossus smiti  Mendez, 1956
Stenistomera alpina  (Baker, 1895)
Stenistomera macrodactyla  Good, 1942
Anomiopsyllus amphibolus  Wagner, 1936
Anomiopsyllus nudatus  (Baker, 1898)
Ceratophylloidea

Ischnopsyllidae

*Myodopsylla gentilis* Jordan & Rothschild
*Sternopsylla distincta texana* (C. Fox, 1914)

Ceratophyllidae

Leptopsyllinae

*Jordanopsylla allredi* Traub and Tipton, 1951
*Peromyscopsylla hesperomys ravalliensis* (Dunn, 1923)
*Peromyscopsylla hesperomys adelpha* (Rothschild, 1915)

Amphipsyllinae

*Ornithophaga anomala* Mikulin, 1957
*Odontopsyllus dentatus* (Baker, 1904)
*Cienophyllus armatus* (Wagner, 1901)

*Amphipsylla washingtona* Hubbard, 1954

Ceratophyllinae

*Oropsylla* (*Thrassis*) *acamantis utahensis* (Wagner, 1936)
*Oropsylla* (*Thrassis*) *acamantis media* (Stark, 1970)
*Oropsylla* (*Thrassis*) *stanfordi* (Wagner, 1936)
*Oropsylla* (*Thrassis*) *francisi francisi* (C. Fox, 1927)
*Oropsylla* (*Thrassis*) *pandorae pandorae* (Jellison, 1937)
*Oropsylla* (*Thrassis*) *petiolata* (Baker, 1904)
*Oropsylla* (*Thrassis*) *bacchi caducus* (Jordan, 1930)
*Oropsylla* (*Thrassis*) *bacchi gladiolis* (Jordan, 1925)
*Oropsylla* (*Thrassis*) *bacchi consimilis* (Stark, 1957)
*Oropsylla* (*Thrassis*) *arizonensis arizonensis* (Baker, 1898)
*Oropsylla* (*Thrassis*) *aridis campestris* (Prince, 1944)
*Oropsylla* (*Thrassis*) *aridis hoffmani* (Hubbard, 1949)
*Oropsylla* (*Oropsylla*) *idahoensis* (Baker, 1904)
*Oropsylla* (*Diamanus*) *montana* (Baker, 1895)
*Oropsylla* (*Opisocrostis*) *tuberculata tuberculata* (Baker, 1904)
*Oropsylla* (*Opisocrostis*) *tuberculata cynomuris* (Jellison, 1939)
*Oropsylla* (*Opisocrostis*) *hirsutus* (Baker, 1895)
*Oropsylla* (*Opisocrostis*) *labis* (Jordan & Rothschild, 1922)
*Nosopsyllus* (*Nosopsyllus*) *fasciatus* (Bosc, 1800)
*Orchopeas leucopus* (Baker, 1904)
*Orchopeas caedens caedens* (Jordan, 1925)
*Orchopeas nepos* (Rothschild, 1905)
*Orchopeas agilis* (Rothschild, 1905)
*Orchopeas neotomae* Augustson, 1943
*Opisodasys* (*Oxypsylla*) *keeni* (Baker, 1896)
*Opisodasys* (*Opisodasys*) *pseudarctomys* (Baker, 1904)
*Malaraeus telchinus* (Rothschild, 1905)
*Malaraeus eremicus* (Baker, 1904)
*Malaraeus grundmanni* (Egoscue, 1899)
Amaradix bitterrootensis vonfinteli  (Prince, 1959)
Amaradix euphorbi  (Rothschild, 1905)
Aetheca wagneri  (Baker, 1904)
Pleochaetis exilis  (Jordan, 1937)
Eumolpius cyrturus  (Jordan, 1929)
Eumolpius eumolpi americanus  (Hubbard, 1950)
Eumolpius eumolpi eumolpi  (Rothschild, 1905)
Megabothris (Amegabothris) abantis  (Rothschild, 1905)
Megabothris (Amegabothris) clantoni princei  Hubbard, 1949
Megabothris (Megabothris) asio megacolpus  (Jordan, 1929)
Ceratophyllus (Amonopsyllus) ciliatus kincaidi  Hubbard, 1947
Ceratophyllus (Monopsyllus) vison  (Baker, 1904)
Ceratophyllus (Ceratophyllus) celsius celsius  Jordan, 1929
Ceratophyllus (Ceratophyllus) affinis neglectus  Smit, 1958
Ceratophyllus (Ceratophyllus) niger  C. Fox, 1908
Ceratophyllus (Ceratophyllus) petrocheloni  Wagner, 1939
Ceratophyllus (Emmareus) garei  Rothschild, 1902
Amphalius runatus necopinus  (Jordan, 1925)
Spicata rara  (I. Fox, 1940)
Spicata nuditenacula  (Prince, 1945)
Foxella ignota  (Baker, 1895)
Dactylopsylla bluei  (C. Fox, 1909)

Vermipsyloidea

Vermipsyllidae
Vermipsyllinae
Chaetopsylla stewarti  Johnson, 1955

Pulicoidea

Pulicidae
Pulicinae
Pulex irritans  Linnaeus, 1758
Echidnophaga gallinacea  (Westwood 1875)
Ctenocephalides felis felis  (Bouche, 1835)
Cediopsylla inaequalis inaequalis  (Baker, 1895)
Cediopsylla inaequalis interrupta  Jordan, 1925
Hoplopylla anomalous  (Baker, 1904)
Euhoplopylla glacialis affinis  (Baker, 1904)
Euhoplopylla glacialis lynx  (Baker, 1904)
Xenopsylla cheopis  (Rothschild, 1903)

Tunginae
Tunga monositus  Barnes & Radovsky 1969

2 *Orchopeas howardi* is deleted from listing. Stark (1958) stated his doubts as to the validity of inclusion. Also, *O. nepos* should be confirmed in Utah because Lewis (2000 – Journal of Vector Ecology 25(2):164-189) considers Utah to be extralimital. *Orchopeas sexdentatus nevadensis* is also deleted; the species *sexdentatus* as defined by Lewis (2000) is known from coastal California only.


5 Documented in Utah by Egoscue (1977 – Great Basin Naturalist 37:75-76.)


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New Books

**Prevention of Bug Bites, Stings, and Disease**
Daniel Strickman, Stephen P. Frances, and Mustapha Debboun
$19.95 Paperback 352 Pages
16 April 2009
ISBN: 9780195365788

"Provides detailed information in a non-technical format, addresses all blood sucking and venomous arthropods worldwide, presents source reduction, barriers, pesticides, and repellents as an integrated system of solving problems from biting and stinging arthropods.

Here is all the information you will ever need--no matter where you are in the world--to identify, avoid, and protect yourself against all manner of blood sucking or venomous arthropods, ranging from scorpions, spiders, ants, and bees to mites, ticks, lice, bed bugs, sand flies, biting midges, mosquitoes, and horse flies. Line drawings and representative color photographs help identify bugs accurately, and information on each
bug's particular habits and habitats allows readers to minimize potentially annoying, painful, and even lethal encounters. This book is packed with helpful tips on using barriers—window-screens, bed nets, smoky coils, and proper clothing, and on choosing the right repellent for the right bug in the right place. Readers also will learn how to apply pesticides safely and effectively. Based on the best available science, this well-illustrated, crystal clear guide will be a welcome guest in any home or back yard, and an essential companion for travelers around the world."

- review from Oxford University Press,

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**Oxford Textbook of Zoonoses:**
Edited by Stephen Palmer, Lord Soulsby, Paul Torgerson, and David W. G. Brown
$375.00 Hardcover 992 Pages
15 September 2011
ISBN: 9780198570028

"Zoonoses are diseases naturally transmissible between vertebrate animals and man including those transmitted by direct contact with infected animals or carcasses, by food or water contamination, and by inhalation of infected dust. They are increasingly important in public health issues. Divided into three sections along the lines of bacteriology, parasitology, and virology, this book comprehensively provides a systematic, cross disciplinary approach to the science and control of all zoonoses, written by international specialists in human and veterinary medicine.

Chapters cover the history of each disease, the scientific basis for the control of zoonoses, the microbiology of the causative agent, pathogenesis, clinical features, symptoms and signs, diagnosis, treatment and prognosis. The epidemiology of each disease is described alongside the strategies for prevention and control. Each of these chapters has been updated for the second edition, and the book also includes new chapters on important public health topics such as interdisciplinary or policy issues as well as new chapters on emerging zoonoses such as SARS and other important emerging diseases and trends.

Part 1: Introduction
1. The global challenge of zoonoses control, Stephen Palmer
2. Deliberate release of zoonotic agents, Stephen Palmer
3. Veterinary and human health surveillance and risk analysis of zoonoses in the UK and Europe, Morgan D., Lysons R. and Kirkbride H.
4. Health impact assessment and burden of zoonotic diseases, Christine M. Budke, Helene Carabin and Paul R. Torgerson
5. Antimicrobial resistance: animal use of antibiotics, Lord Soulsby
Part 2: Bacterial, Chlamydia, and Rickettsial Zoonoses
6. Anthrax, Les Ballie and Theresa Huwar
8. Verocytotoxin-producing Escherichia coli (VTEC) infections, Mohamed A. Karmali and Jan M. Sargeant
9. Lyme borreliosis, Sue O’Connell
10. Tick borne rickettsial diseases, Emmanouil Angelakis and Didier Raoult
11. Flea borne rickettsial diseases, Emmanouil Angelakis and Didier Raoult
12. Epidemic and murine typhus, Emmanouil Angelakis and Didier Raoult
13. Scrub typhus, Emmanouil Angelakis and Didier Raoult
14. Listeriosis, J. McLauchlin
15. Mycobacterioses, Jakob Zinsstag, Borna Muller and Ivo Pavlik
16. Campylobacterioses, A. J. Lawson
17. Chlamydiosis, Margaret Sillis and David Longbottom
18. Q fever, Thomas J Marrie
19a. Other bacterial diseases: Diseases caused by corynebacteria and related organisms, Aruni De Zoysa
19b. Other bacterial diseases: Anaplasmosis, ehrlichiosis and neorickettsiosis, Richard Birtles
19c. Other bacterial diseases: Pasteurellosis, Daniel R.H. Thomas
19d. Other bacterial diseases: Rat-bite fevers, R.L. Salmon
19e. Other bacterial diseases: Streptococcosis, Marina Morgan
19f. Other bacterial diseases: Cat-scratch disease, Michel Drancourt
19g. Other bacterial diseases: Erysiploïd, Robert M. Smith
19h. Other bacterial diseases: Staphylococcal zoonosis, Susan Dawson
20. Leptospirosis, Robert M Smith and Wendy J. Zochowski
21. Yersiniosis and Plague, Michael Prentice
22. Glanders, Sharon J. Peacock and David A. B. Dance
23. Salmonellosis, E. J. Threlfall, J. Wain and C. Lane
24. Tularaemia, Andrew Pearson
Part 3: Viral Zoonoses
25. Arenaviruses, Colin R. Howard
27. Foot-and-mouth Disease, Vesicular Stomatitis, Newcastle Disease, and Swine Vesicular Disease, Satu Kurkela and David W.G. Brown
28. Hantaviruses, Antti Vaheri, James N. Mills, Christina F. Spiropoulou, and Brian Hjelle
29. Herpes B virus (Cercopithecine Herpes 1), David W. G. Brown
30. Influenza, I H. Brown, D. J. Alexander, N. Phin, and M. Zuckerman
31. Marburg and Ebola viruses, G. Lloyd
32. Mosquito-borne arboviruses, E. A. Gould
33. Poxviruses, Hugh W. Reid and Mark Dagleish
34. Prion-protein-related diseases of animals and man, James Hope
35. Rabies and rabies-like viruses, A. C. Banyard and A. R. Fooks
36. Rift Valley fever, R. Swanepoel and J.T. Pawska
37. Tick-borne encephalitides, Patricia A. Nuttall
38. Yellow fever, Thomas P. Monath and J. Erin Staples
39. Severe acute respiratory syndrome (SARS), Merion Evans and Diana Bell
40. Zoonotic paramyxoviruses, Paul A. Rota and William J. Bellini
41. Hepatitis E virus: Animal reservoirs and zoonotic risk, X.J. Meng
Part 4: Parasitic Zoonoses
42. African trypanosomosis, W. Gibson
43. American trypanosomosis (Chagas disease), C.J. Schofield
44. The Leishmanioses, Marina Gramiccia
45. Giardia infections, R.C.A. Thompson
46. Cryptosporidiosis, Aaron R. Jex, Rachel M. Chalmers, Huw V. Smith, Giovanni Widmer, Vincent McDonald and Robin B. Gasser
47. Toxoplasmosis, sarcocystosis, isosporosis, and cyclosporosis, J. P. Dubey
48. Babesiosis and malaria, F. E. G. Cox
49. Microsporidiosis, Louis M. Weiss
50. Blastocystosis, Manoj K. Puthia and Kevin S. W. Tan
51. Cysticercosis and taeniosis: *Taenia solium*, *Taenia saginata* and *Taenia asiatica*, Ana Flisser, Philip S. Craig and Akira Ito
52. Other adult and larval cestodes, Sheelagh Lloyd
53. Cystic echinococcosis, P. R. Torgerson, C. N. L. Macpherson and D. A. Vuitton
54. Alveolar echinococcosis (*Echinococcus multilocularis*) and neotropical forms of echinococcosis (*Echinococcus vogeli* and *Echinococcus oligarthrus*), J. Eckert, P. Deplazes and P. Kern
55. Zoonotic schistosomiosis, Helene Carabin, Maria V. Johansen, Jennifer F. Friedman, Stephen T McGarvey, Henry Madsen and Steven Riley
56. Other trematode infections, Sheelagh Lloyd and Lord Soulsby
57. Strongyloïdosis, T.J. Nolan, T.B. Nutman and G.A. Schad
58. Capillariosis, Choosak Nithikathkul, Prasert Saichua, Louis Royal and John H. Cross
59. *Angiostrongylus cantonensis* and human angiostrongylosis, Qiao-Ping Wang and Zhao-Rong Lun
60. Zoonotic infections with filarial nematodes, Harman S. Paintal and Rajinder K. Chitkara
61. Trichinellosis, Edoardo Pozio
62. Zoonotic hookworm infections, Dwight D. Bowman
63. Anisakiosis (Anisakidosis), Woon-Mok Sohn and Jong-Yil Chai
64. Toxocarosis, Sheelagh Lloyd and Eric R. Morgan
65. Trichostrongylidosis, T. J. Nolan
66. Scabies and other mite infections, K. E. Mounsey and S. F. Walton
67. Flea infestations, Heinz Mehlhorn
68. The Myiases, Mahmoud N. Abo-Shehada
69. Histoplasmosis, L. Joseph Wheat and Lynn Guptill
70. Zoonotic infections with dermatophyte fungi, B. Mignon and M. Monod
71. Occasional, miscellaneous, and opportunistic parasites and fungi, Sheelagh Lloyd
72. Fasciolosis, Michael. Parkinson, John P. Dalton and Sandra M. O'Neill

- review and table of contents from Oxford University Press,
"Arthropod transmitted infections continue to be a front-line issue in all regions of the world. Understanding the insects that transmit diseases, the mechanisms of infection and the resulting diseases is vital to doctors, veterinarians, public health workers and disease control agencies. This major reference examines the biology, classification and control of arthropods that cause disease in animals and humans. The morphology, taxonomy and phylogeny of fleas, flies, lice, mites, midges, mosquitoes and ticks are described, with descriptions of their medical and veterinary significance, diseases they cause, insect distribution and global disease spread. Updated, developed and reworked from Doug Kettle's seminal Medical and Veterinary Entomology, this major new reference presents vital information in encyclopedia format, with alphabetical entries and an extensive index to make key facts easy to find. This new treatment of the subject provides accessible content and up-to-date research, illustrated by line drawings and colour photographs."

- review from CABI, http://bookshop.cabi.org/page=2633&pid=2496&site=191

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**Featured research**


Bouhsira, Emilie; Ferrandez, Yann; Liu, MaFeng; Franc, Michel; Boulouis, Henri-Jean; Biville, Francis (fbiville@pasteur.fr). 2013. *Ctenocephalides felis* an in vitro potential vector for five *Bartonella* species. Comparative Immunology Microbiology and Infectious Diseases Volume: 36  Issue: 2  Pages: 105-111  DOI: 10.1016/j.cimid.2012.10.004  Published: MAR 2013.

The blood-sucking arthropod *Ctenocephalides felis* has been confirmed as a
vector for *Bartonella henselae* and is a suspected vector for *Bartonella clarridgeiae*, *Bartonella quintana* and *Bartonella koehlerae* in *Bartonella* transmission to mammals. To understand the absence of other *Bartonella* species in the cat flea, we have developed an artificial flea-feeding method with blood infected successively with five different *Bartonella* species. The results demonstrated the ability of these five *Bartonella* species to persist in *C. felis* suggesting an ability of fleas to be a potential vector for several *Bartonella* species. In addition, we demonstrated a regurgitation of *Bartonella* DNA in uninfected blood used to feed *C. felis* thus suggesting a potential horizontal transmission of *Bartonella* through *C. felis* saliva. On the contrary, no vertical transmission was detected in these artificial conditions.


The control of insect-borne zoonoses often involves chemicals or biological means, e.g. genetically modified insects or sterile insects to reduce vector populations. However, another possibility is the use of arthropods to carry no longer a pathogen but a vaccine. Using vectors as "living syringes" provides a unique way of reaching inaccessible wild host populations. This in order to protect endangered wild species directly, but it could also reduce risk of zoonoses to humans while protecting the wildlife species that acts as a disease reservoir.

Our research focuses on the protection of the European Wild Rabbit *Oryctolagus cuniculus* (L.) against 2 fatal viral diseases: myxomatosis and RHD (Rabbit Hemorrhagic Disease), using a specific rabbit flea species. We give an overview of our project and provide a synthesis of work completed. There are two major research areas: entomology and virology.

Entomology studies have involved (i) selection of a suitable vector, (ii) laboratory studies to develop an efficient mass rearing, (iii) verification that it has no unforeseen impact on the ecosystems where it is introduced and (iv) definition of a field release strategy. The selection of the flea species *Xenopsylla cunicularis* (Siphonaptera: Pulicidae) is based on its high host specificity, its simple life cycle (compared to other rabbit flea species) and its ecological requirements. We recently showed that fleas persisted only briefly when released outside their natural range (uncontrolled proliferation impossible). Through the study of the biotic potential of *X. cunicularis*, its behavior and that of its host, and through optimization technique, we are able to produce 25000 fleas/rabbit/week. Trials in experimental enclosures allowed us to develop a release method that promotes host-parasite contact while minimizing insect loss.

Virology involves development of an efficient vaccine against the 2 diseases that
can be transmitted by the insect-vector. Among the various natural strains of myxomatosis, the most suitable according to us is a virus of very low virulence (grade IV), which causes the formation of antibodies in rabbits without mortality, yet protects them against further acute disease. This attenuated strain also maintains a good "genetic resistance" among rabbit populations. Regarding RHD, as virus culture is impossible, it was necessary to use a viral recombination. By incorporating the virus coat genome (VP60) of RHDV into the grade IV myxoma virus, Prof. Yi Li (University of Wurhang – China, in collaboration with Bio Espace), has constructed a recombinant RHD/myxomatosis virus as a potential vaccine against both diseases. This is currently undergoing laboratory testing.

Finally, at the interface between entomology and virology, we are working on a method for introducing sufficient vaccine onto the mouthparts of mass-reared fleas to assure transmission to rabbits when fleas are released into rabbit warrens.


External and internal features of the head of adults of Merope tuber were examined and described in detail. The results were compared to conditions found in other members of Mecoptera and other antliophoran lineages. A list of characters of different body parts and life stages is presented. The parsimony analysis and a recent evaluation of thoracic features suggest a basal placement of Merope within monophyletic Pistillifera. The monophyly of Mecoptera was not supported by our data set. Nannochoristidae (Nannomecoptera) was placed as sister taxon of a clade comprising Diptera and Siphonaptera. Cephalic features supporting this group are modifications of the
mouthparts linked to feeding on liquid substrates. Considering recent results of extensive morphological and molecular investigations we consider this placement of Nannochoristidae and the implied mecopteran paraphyly as a possible artefact. Potential cephalic autapomorphies of Mecoptera are the presence of a tooth-like projection of the gena and a prepharyngeal tube, the absence of *M. frontolabralis*, and the origin of *M. tentoriooralis* on the middle region of the anterior tentorial arm. Despite of the conspicuous morphological differences between *Caurinus* and the other boreid genera the family forms a well supported clade. A sistergroup relationship between Boreidae and Pistillifera is confirmed. A unique synapomorphy is the presence of specialized dilator muscles of the salivary duct. The reconstruction of the relationships of the pistilliferan taxa is strongly impeded by a serious lack of morphological data. However, a group comprising Eomeropidae, Choristidae, Apteropanorpidae, Panorpidae and Panorpodidae is supported in our analyses. Further well documented anatomical data are needed for a reliable reconstruction of mecopteran relationships. The collecting and morphological study of larvae should also have high priority. Inherent problems are extreme secondary modifications of cephalic features of *Caurinus* and *Nannochorista*.


Results from flea fauna recovered in 13 caves located in five different provinces in Andalusia, Spain (Jaén, Almería, Málaga, Córdoba, and Cádiz) are reported. Five flea species were identified. *Typhloceras favosus rolandi* (1 ♂, 4 ♀) was found in four caves from three different provinces (Almería, Córdoba and Cádiz). *Ctenophthalmus baeticus gemellus* (2 ♂) was found only in the cave located in the province of Cádiz. C. *andorrensis veletensis* (4 ♂) was detected in the two caves in Jaén. *Leptopsylla taschenbergi amitina* (2 ♂, 3 ♀) was found in two caves from two different provinces (Jaén and Almería). *Nosopsyllus fasciatus* (61 ♂, 59 ♀) was present in five of the eight caves studied in the province of Almería and in the caves in the province of Málaga. None of the Siphonaptera detected is a species specific to bats. Of the 13 caves studied, 11 harbored only one species of flea.

Hastriter, M.W., Bush, S.E. 2013. Description of *Lentistivalius philippinensis*, a new species of flea (Siphonaptera, Pygiosyllomorpha, Stivaliidae), and new records of ascodipterinae (Streblidae) on bats and other small mammals from Luzon, the Philippines. *ZooKeys*, 260, pp. 17-30.

During May 2009 and July 2011, we collected 357 mammals and examined each for ectoparasites. Among the ectoparasites collected, a new species of flea was discovered. This new species, *Lentistivalius philippinensis*, is described from the male sex only. Two males were recovered from two specimens of the soricid *Crocidura grayi* Dobson in Municipality Maria Aurora, Aurora Province, Luzon, Philippines. Additional fleas included *Thaumapsylla breviceps orientalis* Smit, *Thaumapsylla longiforceps* Traub, and *Ischnopsyllus indicus* Jordan. Although the latter species is common in Japan and documented in Guam (as well as mainland Southeast Asia) also on *Pipistrellus*. 
javanicus (Gray), I. indicus represents a new record in the Philippine Islands. The ascodipterinae (Streblidae) Maabella stomalata and Ascodipteron speiserianum Muir collected from Rhinolophus inops K. Andersen and Rhinolophus subrufus K. Andersen, respectively, also represent new host records. A key to the species of the flea genus Lentistivalius Traub is provided.


The commonly accepted understanding of modern human plague epidemics has been that plague is a disease of rodents that is transmitted to humans from black rats, with rat fleas as vectors. Historians have assumed that this transmission model is also valid for the Black Death and later medieval plague epidemics in Europe. Here we examine information on the geographical distribution and population density of the black rat (Rattus rattus) in Norway and other Nordic countries in medieval times. The study is based on older zoological literature and on bone samples from archaeological excavations. Only a few of the archaeological finds from medieval harbour towns in Norway contain rat bones. There are no finds of black rats from the many archaeological excavations in rural areas or from the inland town of Hamar. These results show that it is extremely unlikely that rats accounted for the spread of plague to rural areas in Norway. Archaeological evidence from other Nordic countries indicates that rats were uncommon there too, and were therefore unlikely to be responsible for the dissemination of human plague. We hypothesize that the mode of transmission during the historical plague epidemics was from human to human via an insect ectoparasite vector.


We collected Oropsylla montana from rock squirrels, Spermophilus varigatus [sic, variegatus], and infected a subset of collected fleas with Yersinia pestis, the etiological agent of plague. We used bar-tagged DNA pyrosequencing to characterize bacterial communities of wild, uninfected controls and infected fleas. Bacterial communities within Y. pestis-infected fleas were substantially more similar to one another than communities within wild or control fleas, suggesting that infection alters the bacterial community in a directed manner such that specific bacterial lineages are severely reduced in abundance or entirely eliminated from the community. Laboratory conditions also significantly altered flea-associated bacterial communities relative to wild communities, but much less so than Y. pestis infection. The abundance of Firmicutes decreased considerably in infected fleas, and Bacteroidetes were almost completely eliminated from both the control and infected fleas. Bartonella and Wolbachia were unaffected or responded positively to Y. pestis infection.


The flea fauna of Patagonia in Argentina comprises about 50% of the total species and subspecies known for Argentina. Given the high diversity of environments and the rich assemblage of sigmodontine rodents of the Patagonian region, flea richness is probably underestimated. In the present study, 16 species and subspecies of fleas parasitizing sigmodontines from Northern Patagonia are reported. Fifteen new parasite–host associations and new records of geographical distribution are reported. The results suggest the coexistence of an endemic flea fauna (*Tetrapsyllus* (*Tetrapsyllus*) *tantillus*; *Tetrapsyllus* (*Tetrapsyllus*) *rhombus*; *Ectinorus* (*Ectinorus*) *spiculatus*; *Agastopsylla boxi boxi*; and *Sphinctopsylla ares*) with other species and genera that occur mainly at lower latitudes than those of Patagonia (*Tetrapsyllus* (*Phylliver*) *bleptus*; *Ectinorus* (*Ectinorus*) *hapalus* and *Polygenis* (*Polygenis*) *rimatus*). Considering that the same situation occurs with some species and genera of their sigmodontine hosts, future studies will allow us to determine the distributional limits of each flea taxon and analyze the influence of host geographical distribution.


Fleas associated with small mammals from seven localities from northern and central Chile were assessed. We captured 352 small mammals belonging to 12 species from which we obtained 675 fleas belonging to 15 different species. The most frequently captured flea species were *Neotyphloceras crassispina crassispina* (n=198) and *N. chilensis* (n=175). High values of flea species richness and diversity were found in Fray Jorge National Park (NP), a north-central Chilean site, whereas the highest values of mean abundance (MA) and prevalence were found in three diverse sites that include Los Molles River, a high altitude site located in north-central Chile, Fray Jorge NP and Dichato, in south-central Chile. On the other hand, high values of flea richness and diversity were found on two rodent species, *Abrothrix olivacea* and *A. longipilis*, whereas the highest values of MA and prevalence were found on *Oligoryzomys longicaudatus*, *A.*
longipilis and Phyllotis xanthopygus. A total of three new host recordings, nine new localities and nine new host species and locality recordings are reported. Also, this study represents the first known record of Tetrapsyllus (Tetrapsyllus) comis in Chile and the first ecological analysis of Neotyphloceras chilensis.


A study on the ecological patterns characterizing the community of arthropods parasitic of sigmodontine rodents was carried out in an area that represents the environmental conditions of the Argentinean Chaco. Four species of mites (Laelapidae and Macronyssidae), one of tick (Ixodidae), and five of fleas (Rhopalopsyllidae and Stephanocircidae) were collected on six species of sigmodontine rodents (Cricetidae: Sigmodontinae). As a generality, the parasite taxa studied in this work presented similar patterns of host specificity and aggregation. With the exception of laelapid mites, the remainder taxa exhibited low levels of host specificity. All parasites show a tendency toward aggregation, and the pattern of host usage appears to be constant on geographical scales. Ticks (immature stages of A. tigrinum) were found on sigmodontines during the whole year with peaks of abundance in different seasons, while mites and fleas were detected from late summer to late spring, with the peak of abundance in winter. A significant positive correlation between monthly abundance of rodents and monthly abundance of mites and fleas was found, suggesting that the pattern of seasonality of these two taxa could be determined by the seasonal abundance of hosts. Finally, the potential epidemiological implications related to the lack of strict host specificity showed by most of the parasites studied in this work were discussed.


Background: During a two year period, a 27-year-old female veterinarian experienced migraine headaches, seizures, including status epilepticus, and other neurological and neurocognitive abnormalities. Prior to and during her illness, she had been actively involved in hospital-based work treating domestic animals, primarily cats and dogs, in Grenada and Ireland and anatomical research requiring the dissection of wild animals (including lions, giraffe, rabbits, mongoose, and other animals), mostly in South Africa. The woman reported contact with fleas, ticks, lice, biting flies, mosquitoes,
spiders and mites and had also been scratched or bitten by dogs, cats, birds, horses, reptiles, rabbits and rodents. Prior diagnostic testing resulted in findings that were inconclusive or within normal reference ranges and no etiological diagnosis had been obtained to explain the patient's symptoms. Methods. PCR assays targeting *Anaplasma* sp., *Bartonella* sp. and hemotopic *Mycoplasma* sp. were used to test patient blood samples. PCR positive amplicons were sequenced directly and compared to Gen Bank sequences. In addition, *Bartonella* alpha Proteobacteria growth medium (BAPGM) enrichment blood culture was used to facilitate bacterial growth and *Bartonella* spp. serology was performed by indirect fluorescent antibody testing. Results: *Anaplasma platys*, *Bartonella henselae* and *Candidatus Mycoplasma haematoparvum* DNA was amplified and sequenced from the woman's blood, serum or blood culture samples. Her serum was variably seroreactive to several *Bartonella* sp. antigens. Despite symptomatic improvement, six months of doxycycline most likely failed to eliminate the *B. henselae* infection, whereas *A. platys* and *Candidatus M. haematoparvum* DNA was no longer amplified from post-treatment samples. Conclusions: As is typical of many veterinary professionals, this individual had frequent exposure to arthropod vectors and near daily contact with persistently bacteremic reservoir hosts, including cats, the primary reservoir host for *B. henselae*, and dogs, the presumed primary reservoir host for *A. platys* and *Candidatus Mycoplasma haematoparvum*. Physicians caring for veterinarians should be aware of the occupational zoonotic risks associated with the daily activities of these animal health professionals.

Mencke, N. 2013. Future challenges for parasitology: Vector control and 'One health' in Europe. The veterinary medicinal view on CVBDs such as tick borreliosis, rickettsiosis and canine leishmaniosis. Veterinary Parasitology, Article in Press.

The medical as well as the veterinary importance of parasitic arthropods or ectoparasites in general terms, is characterized by the primary or secondary impact on the health of humans and companion animals alike. The parasitic arthropods addressed here are those ectoparasites belong to the class of insects, such as fleas and sand flies, or the subclass of acarids, such as ticks. These parasitic arthropods interact intensively with their hosts by blood feeding. Fleas, sand flies and ticks hold the vector capacity to transmit pathogens such as virus, bacteria or protozoa to cats, dogs and humans. The diseases caused by these pathogens are summarized under the terms canine vector-borne diseases (CVBD), feline vector-borne diseases (FVBD) or metazoonoses. In small animal practice, it is important to understand that the transmitted pathogen may either lead to a disease with clinical signs, or more often to asymptomatic, clinically healthy, or silent infections. Blocking of the vector-host interactions, the blood feeding and subsequently the transmission of pathogens during blood feeding is a key element of CVBD control. The focus of this review is on the current knowledge of the epidemiology of parasitic vectors and three important CVBDs they transmit; rickettsiosis, tick borreliosis and canine leishmaniosis from a European perspective, and how veterinary medicine may contribute to the challenges of CVBDs and their control. Prevention of CVBDs is fundamentally based on ectoparasite control. Ectoparasite management in cats and dogs is important not only for the health and well-being of the individual companion animal but for public health in general and is therefore a perfect example of the 'One health'
approach.


Many studies have identified various host behavioural and ecological traits that are associated with parasite infection, including host gregariousness. By use of meta-analyses, we investigated to what degree parasite prevalence, intensity and species richness are correlated with group size in gregarious species. We predicted that larger groups would have more parasites and higher parasite species richness. We analysed a total of 70 correlations on parasite prevalence, intensity and species richness across different host group sizes. Parasite intensity and prevalence both increased positively with group size, as expected. No significant relationships were found between host group size and parasite species richness, suggesting that larger groups do not harbour more rare or novel parasite species than smaller groups. We further predicted that the mobility of the host (mobile, sedentary) and the mode of parasite transmission (direct, indirect, mobile) would be important predictors of the effects of group sizes on parasite infection. It was found that group size was positively correlated with the prevalence and intensity of directly and indirectly transmitted parasites. However, a negative relationship was observed between group size and mobile parasite intensity, with larger groups having lower parasite intensities. Further, intensities of parasites did not increase with group size of mobile hosts, suggesting that host mobility may negate parasite infection risk. The implications for the evolution and maintenance of sociality in host species are discussed, and future research directions are highlighted.


Plague has caused ravaging outbreaks, including the Justinian plague and the "black death" in the Middle Ages. The causative agents of these outbreaks have been confirmed using modern molecular tests. The vector of plague during pandemics remains the subject of controversy. Nowadays, plague must be suspected in all areas where plague is endemic in rodents when patients present with adenitis or with pneumonia with a bloody expectorate. Diagnosis is more difficult in the situation of the reemergence of plague, as in Algeria for example, told by the first physician involved in that outbreak (NM). When in doubt, it is preferable to prescribe treatment with doxycycline while waiting for the test results because of the risk of fatality in individuals with plague. The typical bubo is a type of adenitis that is painful, red and nonfluctuating. The diagnosis is simple when microbiological analysis is conducted. Plague is a likely diagnosis when one sees gram-negative bacilli in lymph node aspirate or biopsy samples. *Yersinia pestis* grows very easily in blood cultures and is easy to identify by biochemical tests and MALDI-TOF mass spectrometry. Pneumonic plague and septicemic plague without adenitis are difficult to diagnose, and these diagnoses are often made by chance or retrospectively when cases are not part of an epidemic or related to another specific epidemiologic context. The treatment of plague must be based on gentamicin or
doxycycline. Treatment with one of these antibiotics must be started as soon as plague is suspected. Analysis of past plague epidemics by using modern laboratory tools illustrated the value of epidemic buboes for the clinical diagnosis of plague; and brought new concepts regarding its transmission by human ectoparasites.


Theory suggests that habitat fragmentation should reduce the risk of being parasitised due to reduced size and increased isolation of the host population. It is predicted that a threshold host population size exists, below which parasites will not be able to persist. Small mammals were trapped and their ecto-parasites removed in 14 field margins of varying widths over 2 years in a highly fragmented agro-ecosystem. No evidence to suggest the presence of a threshold in parasite prevalence was found, which may be due to the high rate of host movement and transiency within the system. Contrary to expectation, the probability of infestation decreased with host abundance and the abundance of alternative hosts, suggesting a dilution effect. The relatively long life cycle of small mammal specialist tick and flea species present under the prevailing environmental conditions may have left the parasites unable to keep up with the rate of reproduction and dispersal of the host. It is important to consider changes in the behaviour of the host and the presence of alternative hosts when predicting the effects of habitat fragmentation on disease spread.


Immune function is an important component of host fitness, and high investment in immunity should occur when the benefits outweigh the costs, such as when risk of parasitism is high. We sampled two rodent hosts, white-footed mice (Peromyscus leucopus), and prairie voles (Microtus ochrogaster), and their tick, flea, and mite ectoparasites. A bacterial killing assay was used to measure the host's innate immune function. We hypothesized that classes of hosts (species, sexes, or age classes) with overall higher tick burdens would have a higher innate immune function as an evolutionary response to historically greater exposure. We hypothesized a weaker relationship between the fleas and mites and immune function because of high host specificity in fleas and the absence of known vector function in North American mites. Ectoparasites were significantly overdispersed on hosts. In accordance with our hypothesis, Peromyscus that had higher tick burdens also exhibited significantly higher bacterial killing ability compared to Microtus. There was no significant difference in total flea burden between rodent species and no relationship with bacterial killing ability. Microtus had higher burdens of mites in each order than Peromyscus, and female rodents had higher mite burdens than males. The benefits of maintaining high levels of innate immune factors appear to be greater than the energetic costs for Peromyscus compared to Microtus.
Sammak, Rebecca L.; Rejmanek, Daniel D.; Roth, Tara M.; Christe, Kari L.; Chomel, Bruno B.; Foley, Janet E. 2013. Investigation of Tularemia Outbreak after Natural Infection of Outdoor-Housed Rhesus Macaques (Macaca mulatta) with Francisella tularensis. Comparative Medicine (Memphis) Volume: 63 Issue: 2 Pages: 183-190 Published: APR.

In the summer and fall of 2010, a series of outdoor-housed rhesus macaques were diagnosed with tularemia. PCR analysis or positive culture confirmed 11 cases, and 9 additional animals with similar clinical signs responded to empiric antibiotic treatment. A serosurvey conducted in the 9 mo after the outbreak found 53% (43 of 81 macaques) seropositivity in the southern outdoor colony, which had an average population of 700 animals. A prospective survey of small mammal reservoirs and arthropod vectors was conducted during the late summer and fall of 2011. PCR analyses of tissues from all 135 mice, 18 ground squirrels, 1 rat, 3 raccoons, 2 cats, and 3 jackrabbits and their fleas were negative for DNA of Francisella tularensis. Conventional PCR evaluation of stored DNA from affected macaques identified the causative organism as F. tularensis subsp. holarctica [sic, holarctica]. DNA evaluated from historic cases of tularemia in nonhuman primates confirmed that the organism that infected the colony during the late 1980s likewise was F. tularensis subsp. holarctica [sic, holarctica]. The macaque tularemia epizootic of 2010 appears to have been an extreme example of the periodic resurgence of tularemia. No evidence of rodent disease was found in the immediate vicinity during the 2011 interepizootic period. The concurrent widespread seropositivity (53%) and low incidence of clinical disease (2.7%) in 2010 suggests that this strain of Francisella has low pathogenicity in macaques.

Traversa, D. 2013. Fleas infesting pets in the era of emerging extra-intestinal nematodes. Parasites and Vectors, 6 (1), art. no. 59.

Modifications in climatic conditions, movements of hosts and goods, changes in animal phenology and human behaviour and increase of wildlife, are presently concurring in the geographic spread of vectors and cardio-respiratory nematodes, e.g. Dirofilaria immitis, Angiostrongylus vasorum, Aelurostrongylus abstrusus and Capillaria aerophila. All these factors may also influence dispersion and clinical significance of fleas, thus posing relevant challenges in those regions where other parasites are emerging at the same time. Ctenocephalides felis, Ctenocephalides canis and Pulex irritans cause discomfort, nuisance, allergic reactions, anaemia, and may transmit several pathogens, some of them are of importance for public health. The present article reviews the importance of fleas in small animal practice and their sanitary relevance for dogs, cats and humans, and discusses current control methods in the present era of emerging extra-intestinal nematodes, towards a possible changing perspective for controlling key parasites affecting companion animals.

VAN DER Mescht, Luther; Peter C LE Roux; Sonja Matthee. 2013. Remnant fragments within an agricultural matrix enhance conditions for a rodent host and its fleas. Parasitology 140, 368.
Habitat fragmentation can adversely impact biodiversity, although where remnant fragments of natural vegetation provide favourable conditions the negative effects of fragmentation may be mitigated. Host-parasite systems in fragmented areas have only recently been examined, with parasites generally showing higher prevalence and richness in fragments, mediated by changes in host density. However, the effect of fragmentation on parasite body size and fecundity remains poorly investigated. Thus, here we compared the body size and condition of a generalist rodent host, *Rhabdomys pumilio* and the body size of 2 common flea species between pristine natural areas and remnant fragments within agriculture areas. Host body length, weight and body condition values were significantly larger in fragments than in pristine natural vegetation. *Listropsylla agrippinae* fleas showed the same pattern, being significantly larger in fragments, while *Chiastopsylla rossi* fleas did not differ in size between fragments and natural areas. The differential response of the 2 flea species may reflect the strength of association between the host and parasite, with the former spending a greater proportion of its lifespan on the host. Therefore, in this study agriculture fragments provide better conditions for both an opportunistic rodent and a closely associated flea species.


The Riverine Barriers Hypothesis (RBH) posits that tropical rivers can be effective barriers to gene flow, based on observations that range boundaries often coincide with river barriers. Over the last 160 years, the RBH has received attention from various perspectives, with a particular focus on vertebrates in the Amazon Basin. To our knowledge, no molecular assessment of the RBH has been conducted on birds in the Afrotropics, despite its rich avifauna and many Afrotropical bird species being widely distributed across numerous watersheds and basins. Here, we provide the first genetic evidence that an Afrotropical river has served as a barrier for birds and for their lice, based on four understory bird species collected from sites north and south of the Congo River. Our results indicate near-contemporaneous, Pleistocene lineage diversification across the Congo River in these species. Our results further indicate differing levels of genetic variation in bird lice; the extent of this variation appears linked to the life-history of both the host and the louse. Extensive cryptic diversity likely is being harbored in Afrotropical forests, in both understory birds and their lice. Therefore, these forests may not be museums of old lineages. Rather, substantial evolutionary diversification may have occurred in Afrotropical forests throughout the Pleistocene, supporting the Pleistocene Forest Refuge Hypothesis. Strong genetic variation in birds and their lice within a small part of the Congo Basin forest indicates that we may have grossly underestimated diversity in the Afrotropics, making these forests home of substantial biodiversity in need of conservation.
Fleas in Art and History

The Steel Flea, an excerpt


... WHEN the Emperor Alexander Pavlovitch had finished the Congress of Vienna he took a fancy to travel all over Europe and view the marvels of the different realms. He journeyed through all lands, and everywhere, by reason of his amiability, he always held the most internecine [The old gunsmith's love for big words and lack of education lead to many comical results, as in this substitution of "internecine" for "international. A good many of these punning or dart-winged words cannot be adequately indicated in English, but they produce quite inimitable results in the original. - I.F.H.] discussions with all men, and all amazed him by one means or another and sought to incline him to their side. But he had a Cossack of the Don, named Platoff, attached to his personal service, who did not like this inclination, and, being homesick for his own hearthstone, he constantly sought to lure the Emperor to his home.

So, as soon as Platoff perceived that the Emperor took a deep interest in any foreign thing and all his suite held their peace, he began to say immediately: "Thus and so, and we have the same thing of our own at home, not a whit worse," — and then he would turn him aside in one way or another.

The English people were aware of this, and had prepared various cunning devices against the Emperor's arrival, to the end that they might captivate him with foreign things, and in many cases they attained their object, especially in the great assemblies where Platoff could not express himself perfectly in French; but he did not mind that overmuch because he was a married man, and regarded all French conversation as mere emptiness, unworthy of his imagination.

But when the English began to invite the Emperor to all their arsenals, armories, shops, and soap-sawing factories, in order to demonstrate their superiority over us in all things, Platoff said to himself: "Come, there has been enough of this sort of thing. Up to this point I have endured in patience, but beyond this 'tis impossible. I may manage to say the right thing or I may not, but I won't betray my own people."

And no sooner had he uttered these words to himself than the Emperor said to him: "Thus and so. Tomorrow you and I will go to inspect their arsenal museum. "There," says he, "exist such perfections of nature, that when you look upon them you will no longer dispute the fact that we Russians, in spite of all our self-importance, are of no account whatever."

Platoff made no reply, but merely buried his hooked nose in his shaggy felt cloak [The burka, which is impenetrable to rain, and serves as blanket, also., retired to his quarters, commanded his orderly to fetch a flask of Caucasian brandy — "kiz/yarii" [Made from the "iizilf", a small sourish fruit which grows in the Caucasus and the Crimea.] — from the cellaret, tossed off a bumper, prayed to God before a holy picture which folded up for travelling, wrapped himself in his thick felt mantle, and began to snore so that not a single Englishman in all the house was able to sleep.
He said to himself: "The morning is wiser than the evening".

II. On the following day the Emperor and Platoff went to the museum. The Emperor took none of the other Russians with him, because he had been provided only with a two-seated carriage. [The Emperor always has a Cossack orderly on the box of his carriage. Platoff has been promoted by the gunsmith to a seat inside.]

They drive up to a smallish building — the entrance indescribable, corridors stretching out interminably, and a row of chambers one after another, and, at last, in the chief hall of all, divers huge busts, and in the centre, under a canopy, stands the Abolo Polveder. ["Half-bucket Apolo" is the old gunsmith's rendering of Apollo Belvedere.]

The Emperor casts a glance at Platoff, to see whether he is much amazed, and what he is gazing at, but Platoff is walking along with downcast eyes as though he beholds nothing, and is merely twisting his mustaches into rings.

The Englishmen immediately begin to exhibit divers marvels and explain to what ends they are adapted in military matters — sea buremeters, mamel's hairmantals of the infantry regiments, [Barometers; camel's hair mantles.] and for the cavalry, tarred waterproofs. All this delights the Emperor greatly — everything seems to him very good, but Platoff preserves his apathy, and nothing has any significance in his opinion.

The Emperor says: "How is this possible — why is there such unfeelingness in thee? Is there really nothing here that astonishes thee?"

And Platoff replies: "One thing only here astonishes me, that my dashing lads of the Don made war without all this and conquered a dozen nations."

The Emperor says: "This is folly."

Platoff replies: "I know not to what to attribute it, but I dare not to dispute and must needs hold my tongue."

But the Englishmen, beholding such a discussion between him and the Emperor, immediately led them to the Abolo Polveder himself, and took from one of his hands a Mortimer gun [A mortar.], and from the other a pistol.

"Here," said they, "this is the sort of manufactures we have," and they gave him the gun.

The Emperor gazed calmly on the Mortimer gun, because he has such in Tzarskoe Selo [Tzarskoe Selo is a suburban town about sixteen miles from Petrograd, with two Imperial palaces, fine Imperial parks, barracks for the Hussars of the Guard, and so forth. The Arsenal there formerly contained a splendid collection of arms, now removed to the Hermitage Museum, in Petrograd.], and then they gave him the pistol, and said: "This pistol is of unknown, inimitable workmanship — our Admiral plucked it from the belt of a bandit chief in Candelabria."

The Emperor looked at the pistol, and could not tear his eyes from it. He gave vent to terrible "ahs!" "Ah, ah, ah!" says he, "what a weapon is this! . . . how is it possible to work so delicately?" And he turns to Platoff and says in Russian: "There now, if I had but one such artisan in Russia, I should be extremely happy and proud, and I would instantly make that man a noble."

But the very minute Platoff hears these words, he thrusts his hands into his voluminous trousers and draws thence a gunsmith's screw-driver.

"This does not unscrew," say the Englishmen. But he, paying no heed, picks away at the lock. He gives it one turn, he gives it another, — and takes out the lock. Platoff
shows the catch to the Emperor, and there, on the curve, stands a Russian inscription: "Ivan Moskvin in the town of Tula."

The Englishmen marvelled, and nudged one another: "Oh, alas! we have blundered!" But the Emperor says sadly to Platoff: "Why hast thou covered them with such confusion? Now I am very sorry for them. Let us go."

They took their places again in the same two-seated carriage, and drove away; and that day the Emperor went to a ball, but Platoff gulped down a still mightier bumper of kizil vodka, and slept a mighty Cossack sleep.

He rejoiced that he had put the Englishmen to confusion, and had placed the Tula artisan in the proper light, but he was also vexed. Why had the Emperor felt pity for the Englishmen on such an occasion?

"For what reason did the Emperor grieve?" thought Platoff. "I don't understand it at all;" and, engaged in this meditation, he twice arose, crossed himself, and drank vodka until, by sheer force, he brought upon himself a profound sleep.

But the Englishmen were not asleep at that time, either, because their heads were whirling round with dizziness. While the Emperor was enjoying himself at the ball, they prepared for him such a fresh marvel that they deprived Platoff of all his fantasy.

III. The next day, when Platoff presented himself to the Emperor to wish him good-morning, the latter said to him: "Let the two-seated carriage be put to immediately, and let us look at more museums." Platoff went so far as to suggest: "Had they not seen enough foreign products, and would it not be better to betake themselves to Russia?" but the Emperor says: "No, I desire to behold still other novelties. They have boasted to me that they make the very finest sort of sugar here."

They drove off.

The Englishmen kept showing the Emperor the different prime products they had, but Platoff stared and stared, and suddenly said: "Show us your manufactures of molva sugar." [Probably intended for "khakja" a very rich paste of honey and nuts.]

But the Englishmen did not even know what molva was. They whispered together, and winked at one another, and kept repeating "Molva", "Molva", but they could not understand that such a sugar was made in our parts, and were obliged to confess that they had all sorts of sugar, but not molva.

Platoff says: "Well, then, you have nothing to brag about. Come to us, and we will treat you to tea with real molva from the Bobrinsky factories." [Count Bobrinsky's extensive beet-sugar factories, in southwest Russia.]

But the Emperor plucked him by the sleeve, and said softly: "Please don't ruin my politics."

Then the Englishmen invited the Emperor to the last museum of all, where were collected all the mineral stones and nymfozoria [Evidently "infusoriae." ] from the whole world, beginning with the hugest Egyptian Keramids, [Pyramids. ] - and going down to the subcutaneous flea, which cannot be seen by the eye, though its bite is between the skin and the body.

The Emperor went.

They had inspected the Keramids and all sorts of stuffed animals, and were on their way out, and Platoff thinks to himself: "Now, glory to God, all is well — the Emperor admires nothing!"

But no sooner had they reached the very last room, when lo! there stood workmen
in their everyday waistcoats and aprons, holding a salver on which there was nothing at all. And the Emperor began to wonder what they were giving him on the empty salver.

"What is the meaning of this?" he asks.

And the English artisans reply: "This is a respectful gift from us to Your Majesty."

"But what is it?"

"Here," they say, "please to observe this tiny speck."

The Emperor looked and saw that the tiniest sort of a speck really was lying upon the salver.

The workmen say: "Please spit on your finger, and take it in your palm."

"But what am I to do with this speck?"

"It is not a speck," they answer, "but a nymfozoria."

"Is it alive?"

"Not at all," they reply: "it is not alive, but it has been forged by us in the image of a flea, out of pure English steel, and in the middle of it are works and a spring. Please wind it up with the little key: it will immediately begin to dance."

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"Here is a document cited in the Bulletin of the Entomological Society of France, several years ago. The book "The Flea" is full of anecdotes, excerpts from poems, songs and reproductions of paintings, engravings, photographs, all on the theme of the flea and its relationship with humans."

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Des compagnons de toujours, 4 Tomes : 1/ La puce, 2/ Pou et Morpion, 3/ Punaise des lits, moustiques, gale et son acarien, 4/ La mouche - J.M. Doby. Livres de 1996 à 1998, édités par l'auteur, 184 + 205 + 236 + 260 pages. Dédicacé par l'auteur. Des Compagnons de toujours: Puce, pou, morpion, punaise... et autres parasites de notre peau, dans l'Histoire, l'Art, la littérature, la chanson, le language, les traditions populaires...). Sommaire Tome 1 : Les origines de la puce de l'homme, Les puces dans l'Antiquité, Puces et génération spontanée, Aspects entomologiques de la puce, Pouvoir pathogène des puces, La puce dans la vie de tous les jours, Relations privilégiées entre la femme et la puce, La puce dans l'orfèvrerie et la mode féminine, La lutte contre les puces, La puce dans le langage, La puce en botanique, La puce dans les noms de lieux et famille, etc... etc...

Aspects of the flea, pathogenicity of fleas, the flea in everyday life, relationships between the woman and the flea, the flea in the jewelry and women's fashion, the fight against fleas, the flea in the language, The flea in Botany, the flea in the names of places and family, etc...


[Relations between woman and flea]

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On the next page, The Flea, by Elisabetta Sirani (ca. 1638- ca. 1665, Bologna, Italy), 100x76cm, oil on canvas.

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