Oikos

o19314

Bordes, F., Guégan, J. F. and Morand, S. 2011. Microparasite species richness in rodents is higher at lower latitudes and is associated with reduced litter size. – Oikos 120: 1889–1896.

Appendix A1 References for microparasites

Bartonella spp.

Castle, K. T. et al. 2004. Prevalence and diversity of *Bartonella* in rodents of northern Thailand: a comparison with *Bartonella* in rodents from southern China. – Am. J. Trop. Med. Hyg. 70: 429–433.

Ellis, B. A. et al. 1999. Rats of the genus *Rattus* are reservoirs host for pathogenic *Bartonella* species: an old world origin for a new world disease? – J. Inf. Dis. 180: 220–224.

Gundi, V. A. et al. 2004. Isolation of *Bartonella rattimassiliensis* sp. nov. and *Bartonella phoceensis* sp. from European *Rattus norvegicus*. – J. Clin. Microbiol. 42: 3816–3818.

Holmberg, M. et al. 2003. *Bartonella* infection in sylvatic small mammals of central Sweden. – Epid. Inf. 130: 149–157.

Kosoy, M. Y. et al. 1997. Distribution, diversity and host specificity of *Bartonella* in rodents from the southeastern United States. – Am. J. Trop. Med. Hyg. 57: 578–588.

Kosoy, M. Y. et al. 2003. *Bartonella* strains from ground squirrels are identical to *Bartonella washoensis* isolated from a human patient. – J. Clin. Microbiol. 41: 645–650.

Liu, Q. et al. 2010. Detection of *Bartonella* species in small mammals from Zhejiang province, China. – J. Wildlife Dis. 46: 179–185.

Marquez, F. J. et al. 2008. Molecular screening of *Bartonella* species in rodents from southwestern Spain. – Vector-Borne Zoonotic Dis. 8: 695–700.

Mediannikov, O. et al. 2005. Molecular screening of *Bartonella* species in rodents from the Russian far east. – Ann. N. Y. Acad. Sci. 1063: 308–311.

Welc-Faleciak, R. et al. 2008. *Bartonella* infection in rodents from different habitats in the Mazury Lake district, northeast Poland. – Vector-Borne Zoonotic Dis. 8: 467–474.

Ying, B. al. 2002. Genetic and ecologic characteristics of *Bartonella* communities in rodents in southern China. – Am. J. Trop. Med. Hyg. 66: 622–667.

Ying, B et al. 2007. *Bartonella* strains in small mammals from Dhaka, Bangladesh, related to *Bartonella* in America and Europe. – Am. J. Trop. Med. Hyg. 77: 567–570.

Ying, B. et al. 2009. Prevalence and genetic heterogeneity of *Bartonella* strains cultured from rodents from 17 provinces in Thailand. – Am. J. Trop. Med. Hyg. 81: 811–816.

Borrelia spp.

Brown, R. N and Lane, R. S. 1996. Reservoir competence of four chaparral–dwelling rodents for *Borrelia burdoferi* in California. – Am. J. Trop. Med. Hyg. 54: 84–91.

Gil, H. et al. 2005. Identification of a new *Borrelia* species among small mammals in areas of northern Spain where Lyme disease is endemic. – Appl. Environ. Microbiol. 71: 1336–1335.

Godeluck, B. et al. 1994. A longitudinal survey of *Borrelia crocidurae* prevalence in rodents and insectivores in Senegal. – Am. J. Trop. Med. Hyg. 50: 165–168.
Humair, P. F. et al. 1993. *Borrelia burdorferi* in a focus of Lyme borreliosis: epizootiologic contribution of small mammals. – Folia Parasitol. 40: 65–70.
Piesman, J. and Gern, L. 2004. Lyme borreliosis in Europe and North America. – Parasitology 129: 191–220.
Salked, D. J. et al. 2008. Identifying reservoir hosts of the Lyme disease spirochete *Borrelia burdoferi* in California: the role of the western gray squirrel (*Sciurus griseus*). – Am. J. Trop. Med. Hyg. 79: 535–540.
Vredevoe, L. K. et al. 2004. Detection and characterization of *Borrelia bissettii* in rodents from the central California coast. – J. Med. Entomol. 41: 736–745.

Cowpox viruses

Crouch, A. C. et al. 1995. Serological evidence for the reservoir hosts of cowpoxvirus in British wildlife. – Epid. Inf. 115: 185–191.
Laakkonen, J. et al. 2006. Serological survey for viral pathogens in Turkish rodents – J. Wildlife Dis. 42: 672–676.
Laakonen, J. et al. 2007. The screening of parasites and viral pathogens of small mammals from a farm in southern Finland, and genetic identification of the Finnish house mouse, *Mus musculus*. – Ann. Zool. Fenn. 44: 202–208.
Sandvik, T. et al. 1998. Naturally occuring Orthpoxviruses: potential for recombination with vaccines. – J. Clin. Microb. 7: 2542–2547.
Tryland, M. et al. 1998. Serosurvey for Orthopoxviruses in rodents and shrews from Norway. – J. Wildlife. Dis. 34: 240–250.

Leptospira spp.

Al Saadi, M. and Post, G. 1976. Rodent leptospirosis in Colorado. – J. Wildlife Dis.72: 315–317
Brown, R. Z. and Gorman, G. W. 1960. The occurrence of Leptospirosal infections in feral rodents in southwestern Georgia. – Am. J. Public Health Nations Health 50: 682–688.
Blood, B. D. et al. 1963. Natural *Leptospirosa pomona* infection in the pampas cavy. – Pub. Health Rep. 78: 537–542.
Cirone, S. M. et al. 1978. Evaluation of the hemagglutination test for epidemiological studies of Leptopsirosis in wild mamals. – J. Wildlife Dis. 14: 193–202.
Hubbert, W. T. and Rosen, M. N. 1966. Isolation of *Leptospirosa ballum* from western harvest mouse (*Reithrodontomys megalotis*). – Bull. Wildlife Dis. Ass. 2: 18–19.
Hooshmand-Rad, P. and Maghami, G. H. 1976. Leptospirosis of small mammals of Iran. I. Serologic tests and isolation of *Leptospirosa hebdomadis* from *Apodemus sylvaticus.* – J. Wildlife Dis. 12: 34–38.
Fennestad, K. L. and Borg-Petersen,C. 1972. Leptospirosis in Danish wild mammals. – J. Wildlife Dis.8: 343–351.
Gressler, L.T. et al. 2010. New serovars of *Leptospira interrogans* in cavy (*Cavia aperea*). – Comp.Clin. Pathol. 19: 119–120.

Masuzawa,T. et al. 2006. Leptospirosis in squirrels imported from United States to Japan. – Emerg. Infect. Dis. 12: 1153–1155.
Redetzke, K. A. and Mc Cann, M. J. 1980. Isolation of *Leptospira* from desert rodents of west Texas. – J. Wildlife Dis.16: 333–337.
Rim, B. M. et al. 1993. Leptospirosis serology in Korean wild animals. – J. Wildlife Dis. 29: 602–603.
Treml, F. et al. 2002. Small mammals – natural reservoir of pathogenic leptospires– Vet. Med. 47: 309–314.
Vanasco, N. B. et al. 2003. Associations between leptospiral infection and seropositivity in rodents and environmental characteristics in Argentina. – Prev. Vet. Med. 60: 227–235.
Wangroongsarb, P. et al. 2002. Survey of leptospirosis among rodents in epidemic areas of Thailand. – J. Trop. Med. Parasitol. 25: 55–58.

Orientia tsutsugamushi

Coleman, R. E. et al. 2003. Occurrence of *Orientia tsutsugamushi* in small mammals from Thailand. – Am. J. Trop. Med. Hyg. 69: 519–524.
Song, H. J. et al. 1998. Molecular and serologic survey of *Orientia tsutsugamushi* infecion among field rodents in southern Cholla Province, Korea. – Am. J. Trop. Med. Hyg. 58: 513–518.

Arenaviruses and Hantaviruses

Benett, S. G. et al. 1999. Hantavirus (Bunyaviridae) infections in rodents from Orange and San Diego, California. – Am. J. Trop. Med. Hyg. 60: 75-84.
Benett, S.G. et al. 2000. Arenevirus antibody in rodents indigenous to coastal southern California. – Am. J. Trop. Med. Hyg. 62: 626-630.
Blasdell, K. et al. 2008. Host range and genetic diversity of Arenaviruses in rodents, United Kingdom. - Emerg. Infect. Dis. 14: 1455-1460.
Ficher-Calvet, E. et al. 2007. Fluctuation of abundance and Lassa virus prevalence in *Mastomys natalensis* in Guinea, West Africa. – Vector-Borne and Zoonotic Dis. 7: 119-128.
Fulhost, C. F. et al. 1999. Natural rodent host associations of Guanarito and Pirital viruses (Familiy Arenaviridae) in central Venezuela. – Am. J. Trop. Med. Hyg. 61: 325-330.
Holsomback, T. S. et al. 2009. Bayou detected in non-Oryzomyine rodent hosts: an assessment of habitat composition , reservoir community structure and marsh rice rat social dynamics. – J. Vec. Ecol. 43: 9-21.
Johnson, K. M. et al. 1981. Recovery of a Lassa–related arenavirus in Zimbabwe. – Am. J. Trop. Med. Hyg. 30: 1291-1293.
Kallio-Kokko, H. et al. 2006. Hantavirus and Arenavirus antibody prevalence in rodents and humans in Trentino, northern Italy. – Epid. Inf. 134: 830-836.
Kosoy, M. Y. et al. 1996. Prevalence of antibodies to Arenaviruses in rodents from the southern and western United states: evidence for an Arenavirus associated with the genus *Neotoma.* – Am. J. Trop. Med. Hyg. 54: 570-576.

Mills, J. N. et al. 2007. A longitudinal study of Hantaviruses infection in three sympatric reservoir species in agroecosystems on the Argentine Pampa. – Vector-Borne Zoonotic Dis. 7: 229-240.
Mills, J. N. et al. 1998. A Survey of Hantavirus antibody in small mammals populations in selected United States parks. – Am. J. Trop. Med. Hyg. 58: 525-532.
Mills, J. N. et al. 1994. Prevalence of infection with junin virus in rodent populations in the epidemic area of Argentine Hemorragic fever. – Am. J. Trop. Med. Hyg. 51: 554-562.
Nitatpattana, N. et al. 2000. Preliminary study on potential circulation of Arenaviruses in the rodent population of Nachkon Pathom Province, Thailand and their medical importance in an evoluting environment. – Southeast Asian J. Trop. Med. Pub. Health 31: 62- 65
Nitatpattana, N. et al. 2002. Hantaan virus antibody prevalence in rodent populations of several provinces of northeastern Thailand. – Trop. Med. Int. Health 7: 840-845.
Saluzzo, J. F. et al. 1988. Lassa fever in Senegal. – J. Inf. Dis. 157: 605.
Tagliapietra, V. et al. 2009. Spatial and temporal dynamics of Lymphocytic Choriomeningitis virus in wild rodents, northern Italy. – Emerg. Infect. Dis. 15: 1019-1025.

Appendix A2

Data on virus and bacteria found in rodents with number of microparasites investigated, sample size, latitude, body mass and litter size (Material and methods)

Species	Number of microparasites investigated	Sample size	Virus richness	Bacteria richness	Mean latitude	Body mass (g)	Litter size
Aethomys chrysophilus	1	13	1	0	13.5°S	78.6	3.6
Akodon azarae	3	551	1	1	29°S	27.3	4.1
Akodon toba	1	31	1	0	23°S		
Amnospermophilus leucurus	1	36	0	0	30.5°N	97.5	8.6
Andalgalomys pearsoni	1	12	1	0	21°S		
Apodemus agrarius	2	176	0	2	39°N	21.5	5.7
Apodemus flavicollis	5	2159	2	2	47.5°N	29.4	5.5
Apodemus sylvaticus	5	862	2	2	50°N	23.4	5.2
Arvicanthis niloticus	2	895	1	1	7.5°N	64.5	5.0
Baiomys taylori	1	136	1	0	26°N	7.8	2.7
Bandicota bengalensis	1	76	0	1	19°N	166.7	8.0
Bandicota indica	4	1156	2	2	18°N	545.0	
Bandicota savilei	4	51	1	2	16°N		
Berylmys berdomerei	1	2	0	1	16°N		
Calomys callosus	1	34	1	0	17°S	41.0	5.1
Calomys laucha	2	439	1	0	28.5°S	34.0	4.7
Calomys musculinus	2	333	1	0	24°S	17.6	5.4
Calomys tener	1	7	1	0	17°S		
Cavia aperea	2	295	0	1	12°S	341.0	2.5

Chaetodipus hispidus	2	12	0	0	33.5°N	35.3	4.9
Chaetodipus californicus	2	36	0	0	35°N	25.5	4.0
Chaetodipus fallax	1	2	0	0	31°N	18.7	
Chaetodipus penicillatus	1	2	0	0	32.5°N	15.2	3.7
Cricetomys gambianus	1	26	0	0	4.5°S	1092.6	3.3
Dipodomys californicus	1	38	0	1	35°N	85.0	2.8
Dipodomys merriami	1	348	0	0	27°N	40.0	2.3
Dipodomys ordii	4	223	0	1	34.5°N	54.5	3.3
Galea musteloides	1	14	1	0	30.5°S	337.9	2.6
Glaucomys volans	3	14	0	2	33°N	65.4	3.2
Holochilus sciureus	1	16	0	0	14°S		
Holochilus brasiliensis	1	3	0	0	28°S	155.0	3.0
Lemmus Lemmus	1	34	1	0	65°N	51.7	5.1
Mastomys natalensis	1	729	1	0	9°S	45.0	14.2
Microtus agrestis	5	145	2	1	56.5°N	46.0	4.4
Microtus arvalis	3	164	1	1	51.5°N	27.5	5.1
Microtus californicus	1	40	1	0	37°N	53.5	4.5
Microtus longicaudus	1	1	0	0	50°N	36.7	5.2
Microtus montanus	1	66	1	0	45°N	49.5	4.8
Microtus ochrogaster	1	3	1	0	45°N	40.0	3.8
Microtus pennsylvanicus	1	26	0	0	48°N	43.7	5.0
Mus caroli	3	21	0	1	12.5°N	11.3	
Mus cervicolor	1	14	0	1	22.5°N	17.7	4.1
Mus Musculus	4	409	2	1	10°N	20.5	6.1
Mus spretus	1	87	0	1	37.5°N	12.8	
Myodes gapperi	2	92	1	1	48°N	20.6	5.0
Myodes glareolus	5	1140	3	2	52°N	20.8	4.3
Myodes rufocanus	2	31	1	1	56°N	29.5	4.1
Myodes rutilus	1	20	1	0	59°N	25.0	7.0
Praomys daltoni	1	23	0	0	5°N	33.5	5.6
Necromys lasiurus	1	27	1	0	18°S	39.9	4.2
Necromys obscurus	1	36	0	0	36°S		
Necromys benefactus	1	142	1	0	34°S		
Neotoma albigula	1	395	0	0	29°N	198.0	2.2
Neotoma cinerea	1	15	0	0	50°N	335.5	3.7
Neotoma floridana	2	33	0	0	35°N	370.5	3.1
Neotoma fuscipes	3	351	1	1	35.5°N	233.6	2.7
Neotoma lepida	3	405	1	1	30.5°N	125.3	2.9
Neotoma mexicana	1	78	0	0	23°N	203.0	2.1
Neotoma micropus	2	29	0	0	25°N	236.3	2.4
Niviventer brahma	1	139	0	0	28°N		
Oligoryzomys flavescens	3	334	1	1	24°S	21.0	3.4
Onychomys leucogaster	1	283	0	1	37°N	40.0	3.6
Oryzomys palustris	3	124	2	1	32.5°N	47.7	3.8
Oxymycterus delator	1	3	1	0	12°S		

Perognathus flavescens	1	30	0	0	37.5°N	9.0	4.8
Perognathus flavus	1	60	0	0	26°N	7.8	4.4
Perognathus parvus	1	3	0	0	43.5°	20.1	4.8
Peromyscus attwateri	1	46	0	0	31.5°N	30.0	4.0
Peromyscus boylii	3	473	1	1	32.5°N	28.7	3.2
Peromyscus californicus	2	307	1	1	26°N	42.0	2.0
Peromyscus eremicus	2	272	1	0	20°N	25.0	2.6
Peromyscus gossypinus	2	187	0	0	29.5°N	29.0	3.6
Peromyscus leucopus	4	1998	1	2	34.5°N	23.0	4.4
Peromyscus maniculatus	5	3841	2	3	39.5°N	20.5	4.7
Peromyscus polionotus	1	65	0	0	30°N	14.0	3.6
Peromyscus truei	2	511	0	1	37°N	27.0	3.5
Praomys rostratus	1	41	0	0	8°N		
Proechimys guairae	1	30	1	0	8°N		
Pseudoryzomys simplex	1	5	1	0	21°S		
Rattus argentiventer	3	86	2	1	3.5°N	202.0	6.9
Rattus losea	3	128	1	1	8°N		7.0
Rattus nitidus	1	5	0	1	23.5°N		
Rattus norvegicus	4	4817	0	1	29°N	280.0	8.7
Rattus tanezumi	1	146	0	1	25°N		
Ratus exulans	3	149	2	1	6°N	70.0	3.6
Reithrodontomys fulvescens	2	408	0	1	21°N	12.5	3.1
Reithrodontomys megalotis	4	789	2	1	32.5°N	11.0	3.3
Scapteromys tumidus	1	13	1	0	33°S		
Sciurus griseus	1	222	0	1	37.5°N	751.7	3.7
Sciurus vulgaris	1	65	1	0	52°N	324.8	5.1
Sigmodon altsoni	1	190	1	0	6°N	55.7	5.0
Sigmodon arizonae	1	22	0	0	28°N		
Sigmodon hispidus	2	1333	2	1	30°N	185.0	5.6
Spermophilus armatus	1	2	0	0	44.5°N	308.0	5.7
Spermophilus beecheyi	2	267	0	1	39°N	609.3	5.7
Spermophilus lateralis	2	36	0	1	42.5°N	157.6	5.1
Spermophilus tridecemlineatus	1	202	0	1	40°N	172.7	7.0
Spermophilus variegatus	1	106	0	0	24°N	663.0	4.3
Tamias dorsalis	1	129	0	0	28.5°S	62.8	5.2
Tamias minimus	2	94	0	1	43°N	44.2	4.9
Tamias striatus	1	32	0	0	40°N	95.7	4.2
Gerbilliscus kempi	1	81	0	0	7°N		
Thaptomys nigrita	1	38	1	0	19.5°S		
Thomomys bottae	1	1	0	0	33°N	103.5	4.3
Zapus hudsonicus	1	20	0	0	33°N	18.3	5.2
Zapus princeps	1	14	0	0	47.5°N	28.8	4.9
Zygodontomys brevicauda	2	230	1	1	9°N	58.0	4.3