

**First Record of Chewing Lice, *Damalinia (Tricholipeurus) lipeuroides* and *D. parallela* (Phthiraptera: Trichodectidae), on White-tailed Deer (Mammalia: Cervidae) in the U.S. Virgin Islands, with a Review of Other Such Introductions Worldwide**

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## N O T E

### First Record of Chewing Lice, *Damalinia (Tricholipeurus) lipeuroides* and *D. parallela* (Phthiraptera: Trichodectidae), on White-tailed Deer (Mammalia: Cervidae) in the U.S. Virgin Islands, with a Review of Other Such Introductions Worldwide<sup>1</sup>

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In pre-Columbian times, the only large terrestrial mammals extant in the Greater Antilles and Leeward Islands were humans and their domestic dogs. White-tailed deer, *Odocoileus virginianus* (Zimmerman), were first introduced from the southeastern United States to what is now the U.S. Virgin Islands (USVI) by European colonists in 1790 (Heffelfinger 2011, Pp. 3–39 *In* Biology and Management of White-tailed Deer, CRC Press, Boca Raton, FL), and deer from an unknown source were brought to Puerto Rico in the 1930s but were later extirpated (Woods 1996, Pp. 131–148 *In* The Scientific Survey of Puerto Rico and the Virgin Islands: An Eighty-year Reassessment of the Islands' Natural History [Ann. N.Y. Acad. Sci. 776: 1–273], N.Y. Academy of Sciences, New York). Before their elimination, a small number of the Puerto Rican deer were removed to and established in St. Kitts in 1931 (Horwith and Lindsay 2000, A Biodiversity Profile of St. Kitts and Nevis. Island Resources Foundation, St. John's, Antigua, [http://www.irf.org/wp-content/uploads/2015/10/BiodiversityProfile\\_StKitts-Nevis.pdf](http://www.irf.org/wp-content/uploads/2015/10/BiodiversityProfile_StKitts-Nevis.pdf)). After 220 y, free-ranging populations of white-tailed deer currently persist in St. Croix, St. John, and St. Thomas, USVI. In 1966, white-tailed deer were reintroduced to Puerto Rico and established in Isla de Culebra (Woods 1996). In the mid-19th Century, white-tailed deer from either Mexico or the Florida Keys (Heffelfinger 2011; Lever

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1985, Naturalized Mammals of the World, Longman Group Ltd., London, UK) were introduced and established in Cuba, where they widely persist to the present (Borroto-Páez 2009, Biol. Invasions 11: 2279–290). And, during a hurricane, several captive white-tailed deer accidentally escaped a local tourist attraction and established a small, free-ranging population in Jamaica in 1988 (Chai 2007, Establishment of the Invasive White-tailed Deer in Portland, Jamaica, Jamaica Clearing-House Mechanism, Kingston, Jamaica, <http://www.jamaicachm.org.jm/Article/PDF/August2007.pdf>).

Only three previous studies have examined the ectoparasites occurring on introduced white-tailed deer in the Caribbean (J.L.C. unpubl.; Corn et al. 2009, J. Med. Entomol. 46: 1483–1489; Hourrigan et al. 1969, J. Am. Vet. Med. Assoc. 154: 540–545), including samples from St. Croix (20 deer in 1967–1968 and 23 deer in 2001–2006) and from Culebra (5 deer in 1989). All these samples were taken in conjunction with efforts to assess and eradicate populations of the introduced tropical bont tick, *Amblyomma variegatum* (F.) Among all previous samples combined, the only documented parasite species found were ticks including tropical horse ticks, *Anocentor nitens* (Neumann), and southern cattle ticks, *Rhipicephalus (Boophilus) microplus* (Canestrini). Pérez Vigueras (1934, Psyche 41: 13–18) also found *R. microplus* on a white-tailed deer in Cuba. We are not aware of any other previous concerted efforts to look at ectoparasites of introduced white-tailed deer in the Caribbean.

More recently, as part of our continuing general effort (Corn et al. 2009; Corn et al. 2011, J. Med. Entomol. 48: 94–100; Corn et al. 2012, Syst. Appl. Acarol. 17: 3–6; Hanson et al. 2007, J. Med. Entomol. 44: 155–157; Mertins et al. 2009, J. Med. Entomol. 46: 1260–1268; Mertins et al. 2011, Syst. Appl. Acarol. 16: 252–254) surveying for exotic ectoparasites on wildlife in the southeastern U.S. and its Caribbean territories, we had the opportunity to examine four white-tailed deer collected in St. John during a local effort to remove invasive species. All four of these animals (two males and two females) were collected by lethal means and examined via thorough visual inspections of the entire carcasses.

Like the earlier-examined deer, these animals were hosts to both *A. nitens* and *R. microplus* ticks, but one animal (an adult male) also was infested with chewing lice. This deer host was collected on 26 January 2010 in the Catherineberg area of Virgin Islands National Park, St. John, USVI. All visible parasites (on the ears and belly) were collected and submitted for examination to the U.S. Department of Agriculture, National Veterinary Services Laboratories (NVSL), Ames, IA (NVSL Accession No. 10-008288) and the lice were morphologically identified using standard references (Lyal 1985, Bull. Brit. Mus. Nat. Hist. [Entomol.] 51: 187–346; Price et al. 2003, Ill. Nat. Hist. Surv. Spec. Pub. 24: 1–501; Scanlon 1960, Wildl. Dis. 5: 1–121). For louse names, we follow the system proposed by Lyal (1985).

The collected lice were *Damalinea (Tricholipeurus) lipeuroides* (Mégnin) (seven females, one male) and *Damalinea (T.) parallela* (Osborn) (one female). Both louse species were originally described in the 19th Century (Mégnin 1884, Le Naturaliste, Paris 6: 494–495; Osborn 1896, U.S. Dept. of Agric., Div. Entomol., Bull. 5: 1–302) from North American white-tailed deer. Both are widespread, common parasites of this host in the eastern half of the continent and down into Mexico, and both often co-occur on the same host individual (Strickland et al. 1981, Pp. 363–389, *In Diseases and Parasites of White-tailed Deer* [Misc. Publ. 7], Tall Timbers Research

Station, Tallahassee, FL; Walker and Becklund 1970, Index-Cat. Med. Vet. Zool., Spec. Pub. 1: 1–45). We have been unable to find any previous report of these lice from either Puerto Rico or the USVI, including in the series of five papers documenting the 34 species of lice known from these islands (Maldonado Capriles 1996, Pp. 201–216, *In The Scientific Survey of Puerto Rico and the Virgin Islands: An Eighty-year Reassessment of the Islands' Natural History* [Ann. N.Y. Acad. Sci. 776: 1–273], N.Y. Academy of Sciences, New York, NY; Maldonado Capriles and Navarro 1967, *Caribb. J. Sci.* 7: 45–64; Wolcott 1923, *J. Dept. Agr. Porto Rico* 7: 5–313; Wolcott 1936, *J. Agr. Univ. Puerto Rico* 20: 1–600; Wolcott 1948, *J. Agr. Univ. Puerto Rico* 32: 1–975).

Unlike some other cervids in the world—most notably European red deer (*Cervus elaphus* L.), fallow deer (*Dama dama* [L.]), Asian sika deer (*Cervus nippon* Timminck s.l.), and chital (*Axis axis* [Exleben])—white-tailed deer have not been widely introduced by humans to other parts of the world (Dolman and Wäber 2008, *Wildl. Res.* 35: 202–214). In addition to the Caribbean, white-tailed deer were introduced and established only on Stewart and South Islands in New Zealand in 1905 (Christie and Andrews 1965, *Tuatara* 13: 1–8; Heffelfinger 2011) and in a few European localities including Finland in 1934 (Nummi 1988, *Univ. Helsinki, Dept. Agric. Forest Zool., Rep.* 9: 1–40; Nygrén 1984, Pp. 561–568, *In White-tailed Deer: Ecology and Management*. Stackpole Books, Harrisburg, PA), the former Yugoslavia beginning in 1970 (Bojović and Halls 1984, Pp. 557–560, *In White-tailed Deer: Ecology and Management*. Stackpole Books, Harrisburg, PA), and the former Czechoslovakia between 1883 and 1906 (Bojović and Halls 1984; Šefrová and Laštůvka 2005, *Acta Univ. Agr. Silv. Mendel. Brun.* 53: 151–170). Free-ranging populations tied to these introductions currently exist—or may exist—in New Zealand, Finland, Sweden, northwestern Russia, Czech Republic, Germany, Serbia, Croatia, and Slovakia. A few historical introductions in other parts of Europe yielded only temporary herds that eventually disappeared (Heffelfinger 2011).

Human translocations of vertebrate hosts do not always result in the concomitant movement of the parasites of those hosts, perhaps because of active efforts to avoid such outcomes (Corn and Nettles 2001, *J. Wildl. Dis.* 37: 413–426) or perhaps simply due to stochastic exclusion of host-specific parasites as a corollary of the founder effect (Poulin 2007, *Evolutionary Ecology of Parasites*. 2nd ed. Princeton Univ. Press, Princeton, NJ; Torchin et al. 2003, *Nature* 421: 628–630). Such exclusionary outcomes typically are associated with introductions of only small numbers of individual hosts, e.g., four or five white-tailed deer from Minnesota in the case of Finland (Kekkonen et al. 2016, *Ann. Zool. Fennici* 53: 69–80; Nygrén 1984). Mey (1988, *Angew. Parasitol.* 29: 113–126), Máca (1991, *Acta Soc. Zool. Bohemoslov.* 55: 1–11), and Rékási (1994, *Parasitol. Hung.* 27: 57–67) indicate that neither *D. lipeuroides* nor *D. parallela* has yet been detected on hosts in Europe but, according to Christie and Andrews (1965) and Tenquist and Charleston (2001, *J. Roy. Soc. N. Z.* 31: 481–542), both lice are present on white-tailed deer in New Zealand.

The presence or absence of these chewing lice on other Caribbean island deer populations is uncertain, although we did not find lice on 23 white-tailed deer we recently examined in St. Croix (Corn et al. 2009). No doubt lice have been continually present on St. John white-tailed deer since introduction of the earliest founding stock but, if present on deer on other islands, they may have escaped

detection in earlier local collections of ectoparasites because those efforts were concentrated upon sampling for ticks. We were able to document the occurrence of lice in the present case simply because we were attempting to sample all forms of ectoparasites extant on the animals we inspected in our efforts to detect any exotic species.

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