

An indexed, annotated bibliography of the German-language papers on ticks and tick-borne diseases translated under the editorship of the late Harry Hoogstraal (1917–1986)

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Abstract

An annotated bibliography is presented describing the 54 German-language tick papers known to have been selected for translation into English under the editorship of the late Harry Hoogstraal during his years at U.S. Naval Medical Research Unit Number Three (NAMRU-3) in Cairo, Egypt. The bibliography is followed by an index to all tick species, subspecies and varieties named in these papers, including junior synonyms, nomina dubia, misidentifications, and lapsus calamorum.

Key words: Hoogstraal bibliography, ticks, translations, German

Introduction

During his long (1949–1986) tenure at U.S. Naval Medical Research Unit Number Three (NAMRU-3), Cairo, Egypt, the late Harry Hoogstraal (1917–1986) edited at least 1,810 translations of scientific papers and books, largely from the Russian literature on ticks and tick-borne diseases. In an earlier compilation (Robbins & Robbins 2003), we described how, over the last decade, we have succeeded in acquiring copies of most of these translations. Currently, our collection contains 1,775 items, of which 1,594 (90%) are from Russian; the remaining 181 comprise 17 other languages, with German far in the lead at 70 translations. However, in keeping with Hoogstraal's reputation as a Renaissance man, almost a quarter of the German titles address non-acarological subjects: mammalogy (T60-61, T142), leishmaniasis (T229), honey bees (T269), parasitology book reviews (T285-290), chromatography (T353, T367), insect chemoreception (T378, T384), and schistosomiasis (T874). Herein, we confine ourselves to providing an indexed, annotated bibliography of the 54 German tick papers that Hoogstraal deemed worthy of an Anglophone audience. Together, these works discuss 208 taxa representing all three extant tick families—ample evidence that *die schöne Sprache* remains a vibrant medium of scientific communication.

Annotated Bibliography

Abar, B., Ackermann, R. & Danielová, V. (1977) Jetzt dran denken: Zeckenenzephalitis. *Medical Tribune*, Wiesbaden 12, 1 & 7. (T1258. A reminder that German physicians, particularly during

summer in southern Germany, should consider Central European tick-borne encephalitis when diagnosing infections of the nervous system. Transmitted by *Ixodes ricinus* (Linnaeus), this disease is known from five endemic foci in Baden-Württemberg, eight in Bayern, and one each in Nordrhein-Westfalen and Rheinland-Pfalz.)

- Abar, B., Rehse-Küpper, B., Gibbels, E. & Ackermann, R. (1977) Über weitere Isolierungen und Eigenschaften des Tettang-Virus. *2 Internationales Arbeitskolloquium über Naturherde von Infektionskrankheiten in Zentraleuropa*, Graz. pp. 181–185. (T1187. Pools of *Ixodes ricinus* (Linnaeus) collected from 1972 to 1975 in the German states of Nordrhein-Westfalen and Bayern yielded seven strains of Tettang virus, indicating that this virus is probably widespread in Europe.)
- Ackermann, R. (1983) Erythema chronicum migrans und durch Zecken übertragene Meningopolyneuritis (Garin-Bujadoux-Bannwarth): Borrelien-Infektionen? *Deutsche Medizinische Wochenschrift*, Stuttgart 108, 577–580. (T1696. Antibodies to a laboratory-propagated strain of *Borrelia duttoni* were demonstrated by indirect immunofluorescence in sera of six patients with erythema chronicum migrans and eight patients with tick-borne meningopolyneuritis. The same methodology revealed spirochetes in specimens of *Ixodes ricinus* collected from sites in Germany where people had been infected, lending credence to the view that spirochetes are the etiological agents of erythema chronicum migrans, tickborne meningopolyneuritis, and what, in the United States, is called Lyme disease.)
- Ackermann, R. & Hörstrup, P. (1977) Die durch Zecken übertragene Meningopolyneuritis Garin-Bujadoux-Bannwarth. *Tropenmedizin und Parasitologie*, Stuttgart 28, 263. (T1411. A brief description of the symptoms of Garin-Bujadoux-Bannwarth syndrome, including the erroneous presumption that this neuroborreliosis is caused by a virus.)
- Ackermann, R., Runne, U., Klenk, W. & Dienst, C. (1980) Erythema chronicum migrans mit Arthritis. *Deutsche Medizinische Wochenschrift*, Stuttgart 105, 1779–1781. (T1695. A detailed description of arthritis in a 46-year-old female patient, appearing two months after erythema chronicum migrans. With rest and anti-inflammatory treatment, the arthritis subsided in six weeks, at which time the erythema also faded, having persisted for three and one half months, despite frequent administration of penicillin and tetracycline. This condition was observed to be nosologically similar to Lyme disease, recently described from the northeastern United States.)
- Afzelius, A. (1921) Erythema chronicum migrans. *Acta Dermato-Venereologica*, Stockholm 2, 120–125. (T1425. An early paper on the clinical characteristics of erythema chronicum migrans, with speculation concerning its etiology, and the observation that this condition sometimes seemed to originate at the site of a bite by the tick *Ixodes reduvius* (Linnaeus) [a junior synonym of *I. ricinus* (Linnaeus)].)
- Allerdist, H. (1982) Durchseuchung mit FSME-Virus (Zeckenzephalitis) in Norddeutschland. *Deutsche Medizinische Wochenschrift*, Stuttgart 107, 1113–1114. (T1708. The supposedly wide distribution of tick-borne encephalitis in the northern German states of Niedersachsen and Schleswig-Holstein is refuted. An ELISA survey for FSME antibodies among forestry personnel, compared to their infestation by ticks, and complemented by surveys of antibodies in wild deer and boar, indicated that the risk of FSME infection is minimal in northern Germany and that vaccination of the local population or vacationers is unwarranted.)
- Balát, F. (1964) Unter welchen Umständen kommt es zum Befall der Wildenten und -gänse mit Zecken und was für eine epidemiologische Bedeutung kann das haben? *Schriftenreihe des Landesamtes für Naturschutz und Landschaftspflege Nordrhein-Westfalen, Festschrift (zum 25 Jährigen Bestehen der Nordrhein-Westfälischen Vogelschutzwerke)*, Essen-Altenhundem. No. 1, pp. 115–120. (T230. Records of *Ixodes ricinus* (Linnaeus) collected from 747 adult, young,

- and newborn wild ducks and geese representing 17 species, chiefly in South Moravia, Czechoslovakia. Tick infestations were seen only on young birds no more than one week old and captured away from their nests in tick-harboring biotopes immediately adjacent to water.)
- Bodemann, H., Hoppe-Seyler, P., Blum, H. & Herkel, L. (1980) Schwere und ungünstige Verlaufsformen der Zeckenzephalitis (FSME) 1979 in Freiburg. *Deutsche Medizinische Wochenschrift*, Stuttgart 105, 921–924. (T1486. During 1979, eight patients contracted tick-borne encephalitis in the vicinity of Freiburg, Baden-Württemberg, Germany. In four of these cases, the course of infection was severe: one patient died from pneumonia and heart failure after six weeks in a coma; another patient was comatose for more than 40 weeks; a third patient suffered flaccid quadriplegia more than 10 weeks after initial coma; and the fourth patient continued to experience leg paresis after nine weeks, plus paralysis of the left arm. This high proportion of severe encephalitis cases contrasts markedly with previous reports from Central Europe, where mortalities have generally ranged between 1 and 4.5%.)
- Brachtel, R. & Korting, G. W. (1973) Zur febrilen und hämorrhagischen Atypie des Erythema chronicum migrans. *Medizinische Welt*, Stuttgart 24, 81–83. (T1412. Two case histories are presented, in which atypical fever and occasional hemorrhagic symptoms accompanied erythema chronicum migrans.)
- Caflish, U., Tönz, O., Schaad, U. B., Aeschlimann, A. & Burgdorfer, W. (1984) Die Zecken-Meningoradiculitis—eine Spirochätose. *Schweizerische Medizinische Wochenschrift*, Basel 114, 630–634. (T1803. Tick-borne meningoradiculitis is characterized by a distinct sequence of symptoms: erythema chronicum migrans, localized pain and, eventually, radicular asymmetric neurological involvement, especially facial palsy, associated with findings of aseptic meningitis. On the basis of specific serological data from three pediatric patients who were infected in Switzerland and the Bodensee area of southern Germany, it is suggested that tick-borne meningoradiculitis is spirochetal, as shown recently for Lyme disease in North America. Analogous positive spirochetal antibody titers were found in other patients with erythema chronicum migrans and in a child with Bäfverstedt cutaneous lymphadenosis. In the vicinity of Luzern, 20% of the specimens in collections of *Ixodes ricinus* (Linnaeus) were infected with spirochetes.)
- Cohen, C. & Luntz, M. H. (1976) Rift-Valley-Fieber und Rickettsianretinitis einschließlich Fluoresceinangiographie. *Klinische Monatsblätter für Augenheilkunde*, Stuttgart 169, 685–699. (T1262. A discussion of the ophthalmological complications and clinical pathology of three cases of Rift Valley fever retinitis and one case of tick bite [= boutonneuse] fever retinitis, all from the University Eye Clinic in Johannesburg, South Africa. The ocular manifestations of these two diseases were indistinguishable, manifesting as localized areas of retinal ischemia and soft exudate formation.)
- Diehl, P. A. (1969) Hämolympfenproteine und Vitellogenese bei *Ornithodoros moubata*, Murray [sic] (Ixodoidea, Argasidae). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, Schaffhausen & Bern 42, 117–125. (T1219. In reared females of *O. moubata* from Ulanga District, Tanzania, specific female proteins are found in high concentrations in the hemolymph during vitellogenesis. It is thought that these proteins are taken into the oocyte by micropinocytosis and that they are stored there as yolk.)
- Diehl, P. A. (1970) Zur Oogenese bei *Ornithodoros moubata* Murray [sic] (Ixodoidea: Argasidae) unter besonderer Berücksichtigung der Vitellogenese. *Acta Tropica*, Basel 27, 301–355. (T515. In *O. moubata*, oogenesis may be divided into four stages: premeiotic nuclear processes, cytoplasmic growth or previtellogenesis, yolk formation or vitellogenesis, and ovulation/postovulation. Each of these stages is described histochemically, using reared ticks from Ulanga District, Tanzania.)

- Eichenberger, G. (1970) Das Zentralnervensystem von *Ornithodoros moubata* (Murray), Ixodoidea: Argasidae, und seine postembryonale Entwicklung. *Acta Tropica*, Basel 27, 15–53. (T419. A detailed histological examination of the central nervous system of *O. moubata*, based on reared material from Ulanga District, Tanzania, with comparative studies of *O. savignyi* (Audouin) and *O. tartakovskyi* Oleney, plus a review of the literature on similar investigations using ixodid ticks.)
- Enigk, K. & Grittner, I. (1952) Die Exkretion der Zecken. *Zeitschrift für Tropenmedizin und Parasitologie*, Stuttgart 4, 77–94. (T449. A study of the behaviors and mechanisms associated with excretion in a wide range of argasid and ixodid ticks: *Argas reflexus* (Fabricius), *Ornithodoros coriaceus* Koch, *O. lahorensis* Neumann, *O. moubata* (Murray), *O. rostratus* Aragão, *Amblyomma hebraeum* Koch, *A. variegatum* (Fabricius), *Boophilus calcaratus* (Birula) [a junior synonym of *B. annulatus* (Say)], *B. decoloratus* (Koch), *Dermacentor marginatus* (Sulzer), *Haemaphysalis leachi* (Audouin), “*Hyalomma detritus*” [= *H. detritum* Schulze], *H. rufipes* Koch, *H. rufipes glabrum* Delpy [a junior synonym of *H. marginatum turanicum* Pomerantzev], *H. savignyi* (Gervais) [a junior synonym of *H. anatolicum anatolicum* Koch], *Ixodes ricinus* (Linnaeus), *Rhipicephalus bursa* Canestrini & Fanzago, *R. evertsi evertsi* Neumann, and *R. sanguineus* (Latreille).)
- Germershausen, C. F. (1789) *Das Ganze der Schafzucht aus Beurteilung und Berichtigung älterer und neuerer Theorien nach Gründen und eigener Erfahrung. Erster Teil.* Leipzig, Johann Friedrich Junius, pp. 374–375. (T462. Early arguments for and against a relationship between tick infestation of sheep and pasturing in woodlands, including the observation that sheep are more likely to be infested if they are poorly fed, poorly pastured, or kept in dirty stables.)
- Geutebrück, C. A. (1766) *Gesammelter Unterricht von Schafen und Schäfereien zum Behuf der dabei vorkommenden ökonomischen, Policei- und Kameral-Geschäfte.* Leipzig, Hilscher, p. 237. (T461. Recipes for early ointments intended to rid sheep of ticks.)
- Gothe, R. (1971a) Die durch *Argas (Persicargas) persicus*-Larven bedingte Paralyse der Hühner. I. Über den Einfluss des Saugzustandes und der Infestationsrate auf die klinische Manifestation. *Zeitschrift für Parasitenkunde*, Berlin 35, 298–307. (T484. The extent and intensity of paralysis in chickens caused by larval *A. persicus* (Oken) are shown to be more or less directly proportional to the number of engorging larvae, although with increasing host age, relatively fewer larvae are needed to induce a given symptom complex.)
- Gothe, R. (1971b) Die durch *Argas (Persicargas) persicus*-Larven bedingte Paralyse der Hühner. II. Untersuchungen zur Immunität. *Zeitschrift für Parasitenkunde*, Berlin 35, 308–317. (T485. Only after repeated reinfestations by larval *A. persicus* (Oken) do chickens develop a weak immune protective mechanism, which is directed against the engorgement process.)
- Gusev, A. V. (1982) 150 Jahre Zoologisches Institut der Akademie der Wissenschaften der UdSSR. *Angewandte Parasitologie*, Jena 23, 109–111. (T1726. A brief but detailed history of the organization, parasite collections and personnel associated with the Zoological Institute of the Academy of Sciences of the USSR [now Zoological Institute of the Russian Academy of Sciences], founded in St. Petersburg in 1832 to serve as a center for zoological research in Russia.)
- Jenni, L. (1971) Synthese und Aufnahme von Proteinen während der Vitellogenese in Ovocyten von *Ornithodoros* [sic] *moubata*, Murray [sic] (Ixodoidea: Argasidae). *Acta Tropica*, Basel 28, 105–163. (T560. An exhaustive study of the synthesis and assimilation of yolk proteins during vitellogenesis in oocytes of *O. moubata* (Murray), conducted by electron microscopy, using three protein tracers: tritium leucine as a protein precursor, ferritin, and peroxidase.)
- Krüger, K. (1935) Die Doppelt-Schrägstreifung bei den Muskelfasern der Zecken (Ixodidae). *Zeitschrift für Wissenschaftliche Zoologie, Abteilung A*, Leipzig 147, 275–294. (T268. All

- patterns of double oblique striation seen in tick muscles of several species are caused by distortion of transverse striation. This displacement occurs only in relaxed fibers and should therefore not be interpreted as a contraction phenomenon, nor does fixation or a muscle's particular function play a role in the formation of these patterns.)
- Malamos, B. (1938) Versuche mit Leishmanien. IV. Versuche der Kala-azar Übertragung durch Zecken (*Rhipicephalus sanguineus*). *Archiv für Schiffs- und Tropenhygiene*, Leipzig 42, 21–22. (T42. A brief history of attempts to isolate leishmanial agents from ticks that had fed on infected rodents or from the organs of rodents that had been inoculated with emulsions of such ticks. All results were negative.)
- Mayer, A. & Madel, W. (1950) Beobachtungen über das Auftreten und die Bekämpfung von Taubenzecken (*Argas reflexus* F. [sic]). *Desinfektion und Schädlingsbekämpfung*, Staufen 41, 197–199. (T806. A detailed account of massive household infestations of the pigeon tick, *A. reflexus* (Fabricius), in Pforzheim (State of Baden-Württemberg) and in Dietkirchen an der Lahn and Limburg an der Lahn (State of Hessen), with descriptions of this species' life history, the effects of tick bites on birds and humans, and control using CX 99, a hexachlorocyclohexane/synergist emulsion.)
- Mester, H. (1974) Gehäuftes Vorkommen von *Hyalomma excavatum* Koch 1844 (Ixodoidea, Ixodidae) auf Singvögeln. *Beiträge zur Vogelkunde*, Leipzig 20, 181–190. (T1298. Of 462 birds examined on the north side of Menorca, Balearic Islands, between 26 August and 18 September 1971, 30 (6.5%) were infested by tick nymphs and larvae, almost all of which appeared to be *H. anatolicum excavatum* Koch, 1844. Parasitized birds represented eight species in five families of the order Passeriformes.)
- Moskwin, I. A. (1929) Über die Rolle der Zecke (Ixodoidea) *Ornithodoros* [sic] *papillipes* Bir. (Turkestan) in der Übertragung des Rückfallfiebers. *Zeitschrift für Parasitenkunde*, Berlin 2, 73–89. (T1703. A review of the epidemiology of tick-borne relapsing fever in Uzbekistan, together with reports on a series of experiments designed to test the effectiveness of *Ornithodoros papillipes* (Birula) [a junior synonym of *O. tholozani* (Laboulbène & Mégnin)] as a vector of this disease. These experiments demonstrated that infected, field-collected *O. tholozani* transmit spirochetes to laboratory animals solely by the act of feeding, in that no coxal fluid is secreted during engorgement, and inoculation of coxal fluid secreted after feeding did not produce infection. Hospitalized humans suffering from progressive paralysis were also experimentally infected with relapsing fever spirochetes using this tick species.)
- Nemanz, H. (1968) *Ixodes moschiferi* nov. spec. aus Nepal und seine Stellung unter den fissicoxaten *Ixodes*-Arten (Acari: Ixodoidea). *Khumbu Himal*, München 3, 19–26. (T316. The original description of *I. moschiferi*, based on three specimens collected by H. Löffler from the head of a musk deer, *Moschus moschiferus* Linnaeus, near Thami, Nepal, on 12 August 1964. The new species is compared with two other "fissicoxate" *Ixodes*, *I. acutitarsus* (Karsch) and *I. petauristae* Warburton, and the synonymy and types of all three species are discussed.)
- Oefele, F. von (1901) Studien über die altägyptische Parasitologie. Allgemeine Wichtigkeit der Parasitologie für Ägypten. *Archives de Parasitologie*, Paris 4, 481–530. (T430. A discussion of the habits and superstitions affecting personal hygiene in pharaonic Egypt, with passing reference to ticks.)
- Oppermann, E. (1935) Die Entstehung der Riesenspermien von *Argas columbarum* (Shaw) (*reflexus* F. [sic]). *Zeitschrift für Mikroskopisch-Anatomische Forschung*, Leipzig 37, 538–560. (T263. A detailed histological and karyological study of spermatogenesis in argasids, using specimens of *A. columbarum* [a *nomen nudum*; the accepted name is *A. reflexus* (Fabricius)] from Berlin, Giessen (State of Hessen) and Aschaffenburg (State of Bayern). The large size of

- argasid spermatozoa is thought to ensure their survival and fertility during the long periods of starvation that often occur in the life cycle of the Argasidae.)
- Pavlov, P. (1964) Die Rolle der Wildvögel bei der Verbreitung von *Argas persicus* in Bulgarien. *Angewandte Parasitologie*, Jena 5, 167–168. (T187. Observations from 1936 to 1963 in Pleven, Sofia, Tirnovo and Vratza, Bulgaria, led to speculation that a species of *Argas*, herein identified as *A. persicus* (Oken), may transmit leptospirosis from wild birds to humans.)
- Piekarski, G. (1934) Über die Entstehung des vierten Beinpaars bei Zecken. *Zoologischer Anzeiger*, Leipzig 106, 1–4. (T569. Observations and experiments utilizing larvae of *Argas persicus* (Oken) and *A. reflexus* (Fabricius) clearly show that the fourth pair of legs added at molting develop behind the third pair.)
- Putzig, P. (1939) Rauchschnalben-Sterben durch Zecken (Ixodidae) verursacht. *Vogelzug*, Berlin 10, 25–27. (T458. Barn swallows, *Hirundo rustica* Linnaeus, arriving at a farm near Mariental, South West Africa (now Namibia), during December 1937 were often so severely parasitized by *Ixodes frontalis* Panzer that they died of exsanguination.)
- Rehse-Küpper, B., Danielová, V. & Ackermann, R. (1977) Eigenschafte des Tettngang-virus. 2 *Internationales Arbeitskolloquium über Naturherde von Infektionskrankheiten in Zentraleuropa*, Graz. pp. 179–180. (T1261. Tettngang virus was originally isolated from nymphs of *Ixodes ricinus* (Linnaeus) at three ecologically similar sites in western Germany: near Tettngang, a town on the Bodensee (Lake Constance) in Oberschwaben; in the Königsforst east of Köln; and in the Hürtgenwald west of Düren. Like most other European arboviruses, Tettngang is pathogenic for suckling mice, but only marginally, and the low virus titer in mouse brain, even after repeated passages, is remarkable. Also unusual are Tettngang's pronounced heat lability and low antigenic effects.)
- Reinhardt, J. (1975) Virus-Infektion nach Zeckenbiß als Berufskrankheit nach Ziffer 38 der 7. BKVO [Berufskrankheitenverordnung]. *Arbeitsmedizin Sozialmedizin Präventivmedizin*, Stuttgart 10, 232. (T1040. Description of a severe case of Central European tick-borne encephalitis in a forest worker, resulting in permanent physical incapacitation.)
- Roth, W. (1983) Ein Fall von Arthritis durch Zeckenbiß (Lyme-Arthritis). *Kurzbericht. Der Hautarzt*, Berlin 34, 346–347. (T1785. Description of a temporary but painful arthritis in the right knee joint of a man who had been bitten by a tick, presumably *Ixodes ricinus* (Linnaeus), in the hollow of his right knee while visiting a forested area in Romania. Although no erythema chronicum migrans was observed, this appears to have been a case of Lyme arthritis. Treatment was limited to heat therapy, and all symptoms disappeared entirely after 10 days.)
- Runne, U. & Ackermann, R. (1984) Stellungnahme zum Kurzbericht von W. Roth: Ein Fall von Arthritis durch Zeckenbiß (Lyme-Arthritis) – [*Der Hautarzt* (1983) 34: 346–347]. *Der Hautarzt*, Berlin 35, 265–266. (T1770. Comments on the above report by Roth, with the recommendation that tetracycline be used in treating Lyme arthritis, even at a late date or in the absence of symptoms, because surviving spirochetes may have deleterious effects on the central nervous system.)
- Ruser, M. (1933) Beiträge zur Kenntnis des Chitins und der Muskulatur der Zecken (Ixodidae). *Zeitschrift für Morphologie und Ökologie der Tiere*, Berlin 27, 199–261. (T22. Anatomical and histological investigations of the structure of ixodid chitin, the organization of various muscle groups, especially those associated with the digestive and reproductive systems, and the segmentation of the legs.)
- Samson, K. (1909) Zur Spermiohistiogenese der Zecken. *Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin*, Berlin 8, 486–499. (T321. An attempt to correct early descriptions of tick spermatogenesis, in which uncapacitated sperm in the male vas deferens were confused with capacitated sperm in the female genital tract.)

- Schaltenbrand, G. (1967) Durch Arthropoden übertragene Erkrankungen der Haut und des Nervensystems. Nonne-Gedächtnisvorlesung. *Verhandlungen der Deutschen Gesellschaft für Innere Medizin, 72 Kongress (1966)*, München. pp. 975–1005. (T459. Case histories from the late 1950s and early 1960s of several German patients suffering from an arthropod-borne syndrome described as Franconian meningo-encephalo-radiculo-myelitis, the symptoms of which sometimes included erythema chronicum migrans. The author speculates concerning the causative agent, offering arguments for and against bacterial, rickettsial and viral involvement.)
- Schulze, P. (1934) Über eine Zeckenausbeute von Kleinsäugetern aus Java. *Zeitschrift für Parasitenkunde*, Berlin 7, 167–171. (T293. Precise host and locality data for several large tick collections from small mammals in western Java. Eight argasid and ixodid taxa are identified: *Argas* sp., *Amblyomma javanense* (Supino), *Aponomma lucasi* Warburton [a junior synonym of *A. varanensis* (Supino)], *Haemaphysalis koningsbergeri* Warburton & Nuttall, *H. traguli* Oudemans, *Indocentor* [= *Dermacentor*] sp., *Ixodes granulatus* Supino, and *I. spinicoxalis* Neumann.)
- Schulze, P. (1935) Zur Zeckenfauna Formosas. *Zoologischer Anzeiger*, Leipzig 112, 233–237. (T1725. Morphological descriptions, host lists, and statements of distribution for 11 ixodid tick taxa: *Amblyomma formosanum* Schulze [probably a junior synonym of *A. geoemydae* (Cantor)], *A. infestum taivanicum* ssp. nov. [a junior synonym of *A. testudinarium* Koch], *Haemaphysalis birmaniae* Supino [no specimens of *H. birmaniae* exist among the extensive holdings of Taiwanese *Haemaphysalis* in the U.S. National Tick Collection], *H. formosensis* Neumann, *H. hystericis* Supino, *H. warburtoni* Nuttall [possibly also *H. formosensis*; no bona fide specimens of *H. warburtoni* have ever been collected in Taiwan], *Indocentor bellulus* sp. nov. [a junior synonym of *Dermacentor taiwanensis* Sugimoto], *Ixodes acutitarsus* (Karsch), *Rhipicephalus sanguineus* (Latreille), *Uroboophilus distans* Minning [a junior synonym of *Boophilus microplus* (Canestrini)], and *U. sinensis* Minning [a junior synonym of *B. microplus*.])
- Schulze, P. (1938) Über rein glabellare Karapaxbildungen bei Milben und über die Umgestaltung des Vorderkörpers der Ixodoidea als Folge der Gnathosomaentstehung. *Zeitschrift für Morphologie und Ökologie der Tiere*, Berlin 34, 135–149. (T300. A discussion of the hypothetical changes accompanying separation of the anterior segments of the tick body to form the gnathosoma, together with a description of the function and possible origins of Gén e’s organ.)
- Schulze, P. (1941) Das Geruchsorgan der Zecken. Untersuchungen über die Adwandlungen eines Sinnesorgans und seine stammesgeschichtliche Bedeutung. *Zeitschrift für Morphologie und Ökologie der Tiere*, Berlin 37, 491–564. (T855. A survey of the structure and setation of Haller’s organ in all three families of the Ixodoidea, with a discussion of how this organ reveals phylogenetic relationships between tick genera. The new argasid genera *Alveonasus* and *Reticulinasus* are described, as well as the new subspecies *Alectorobius talaje sancti-pauli*.)
- Steigleder, G. K. (1984) *Ixodes-ricinus*-Spiroch aten: wahrscheinlich Ursache der Acrodermatitis chronica atrophicans Herxheimer. *Deutsche Medizinische Wochenschrift*, Stuttgart 109, 3–5. (T1749. A detailed history of clinical, ecological and epidemiological observations associated with acrodermatitis chronica atrophicans, culminating in the discovery of serum antibodies against spirochetes from *Ixodes ricinus* (Linnaeus) specimens associated with this condition.)
- Tessier (1811) *Über die Schafzucht, insbesondere über die Rasse der Merinos. Aus dem Französischen von W. Witte*. Berlin, Hitzig, p. 181. (T460. Various vegetative remedies intended to cure sheep suffering from piroplasmiasis.)
- Wagner-Jevseenko, O. (1958) Fortpflanzung bei *Ornithodoros* [sic] *moubata* und genitale Übertragung von *Borrelia duttoni*. *Acta Tropica*, Basel 15, 118–168. (T322. Detailed morphological and histological examination of the male and female genital tracts in

- Ornithodoros moubata* (Murray), together with infection experiments, demonstrated that spirochetes generally are not transmitted to female ticks during copulation with infected males. Therefore, copulation does not significantly contribute to the spread of spirochetes in tick populations.)
- Wakkerman, C. T. B. & Rijn, J. F. A. van (1965) Strophulus arthropodicus, verursacht durch Ixodiden. *Der Hautarzt*, Berlin 16, 37–38. (T347. The authors propose the term strophulus arthropodicus to describe a papular eruption of the skin caused by acarines, as seen among Dutch blueberry pickers bitten by ticks of the genus *Ixodes*.)
- Weber, K. (1981a) Erkrankungen nach Zeckenbiß. *Zeitschrift für Allgemeinmedizin*, Stuttgart 57, 1158–1163. (T1756. An overview of the four most widespread tick-borne diseases in the former West Germany: Central European tick-borne encephalitis (CEE), known to be of viral etiology; and erythema chronicum migrans, acrodermatitis chronica atrophicans, and tick bite lymphocytoma, all thought to be bacterial diseases. The active and passive Austrian vaccines available against CEE are described, as are methods of tick removal.)
- Weber, K. (1981b) Erythema chronicum migrans und innere Organerkrankungen. *Der Hautarzt*, Berlin 32, 106. (T1757. In answers to a series of questions, the author erroneously assumes that erythema chronicum migrans (ECM) is caused by “rickettsia-like corpuscles” morphologically identified in 1979. European and North American ECM appear to differ, in that the former is chiefly characterized by meningitis, whereas the latter entails a marked arthritis.)
- Weidner, H. (1964) Eine Zecke, *Ixodes succineus* sp. n., im baltischen Bernstein. *Veröffentlichungen aus dem Überseemuseum in Bremen, Reihe A: Naturwissenschaften*, Bremen 3, 143–151. (T123. A brief history of discoveries of fossil acarines, together with the original description of *Ixodes succineus*, based on a single unengorged female, the first tick specimen ever reported from amber (termed “succinum” by Pliny). The new species differs only slightly from *I. ricinus* (Linnaeus) and, on the basis of ecological evidence, the holotype is thought to have been passively transported to the site of its eventual fossilization.)
- Weyer, F. (1970) Zur Frage der Rolle von Arthropoden als Reservoir des Psittakoseerregers. *Zeitschrift für Tropenmedizin und Parasitologie*, Stuttgart 21, 146–153. (T448. In a series of experiments, the causative agent of psittacosis (genus *Chlamydia*), isolated from parakeets, was inoculated into *Ornithodoros moubata* (Murray) via the coxal intersegmental membrane. Successful transmission to ticks was verified by intraperitoneal inoculation of mice with triturated ticks. By this method, live *Chlamydia* were demonstrable in ticks regularly up to 23 days, repeatedly between 30 and 62 days, and once up to 75 days, indicating that such microorganisms may multiply in ticks, which may therefore play a role as reservoirs.)
- Weyer, F. & Mooser, H. (1957) Beobachtungen an Stämmen von Borrelien im Laboratorium. *Zeitschrift für Tropenmedizin und Parasitologie*, Stuttgart 8, 294–304. (T258. Three strains of *Borrelia recurrentis* from Ethiopia, one spirochete strain from Mexican *Ornithodoros turicata* (Dugès), and one strain from Egyptian *O. erraticus* (Lucas) were transmitted to human body lice and kept for several months by louse-to-lice passage. The method of choice for maintaining spirochete strains in lice is intracoelomic inoculation.)
- Yalvac, S. (1939) Histologische Untersuchungen über die Entwicklung des Zeckenadults in der Nymphe. *Zeitschrift für Morphologie und Ökologie der Tiere*, Berlin 35, 535–585. (T274. Histological observations on the development of the hypodermis, cuticle, and glandular sense organs during the nymphal molt in a variety of tick species, together with an account of changes in the dorsoventral musculature during the transition from nymph to adult, and descriptions of the male and female reproductive systems.)

Taxonomic Index

(includes junior synonyms, nomina dubia, misidentifications, and lapsus calamorum, as explained in the annotations)

Argasidae

- Alectorobius jul*: Schulze 1941
Alectorobius talaje capensis: Schulze 1941
Alectorobius talaje sancti-pauli: Schulze 1941
Alectorobius talaje talaje: Schulze 1941
Alveonassus lahorensis: Schulze 1941
Argas arboreus: Gothe 1971a, b
Argas columbarum: Oppermann 1935, Schulze 1941, Wagner-Jevseenko 1958, Yalvac 1939
Argas miniatus: Oppermann 1935, Wagner-Jevseenko 1958
Argas passerinus: Schulze 1941
Argas persicus: Eichenberger 1970, Enigk & Grittner 1952, Gothe 1971a, b, Moskwin 1929, Oppermann 1935, Pavlov 1964, Piekarski 1934, Ruser 1933, Schulze 1941, Wagner-Jevseenko 1958
Argas pipistrellae: Schulze 1934
Argas reflexus: Enigk & Grittner 1952, Mayer & Madel 1950, Oppermann 1935, Piekarski 1934, Schulze 1941, Wagner-Jevseenko 1958
Argas steini: Schulze 1941
Argas vespertilionis: Schulze 1934
Carios dunni: Schulze 1941
Carios hasei: Schulze 1941
Carios pipistrellae: Schulze 1941
Carios testudo: Schulze 1941
Carios vespertilionis: Schulze 1941
Ornithodoros coriaceus: Enigk & Grittner 1952, Weyer 1970
Ornithodoros delanoei acinus: Schulze 1941
Ornithodoros erraticus: Eichenberger 1970, Weyer & Mooser 1957
Ornithodoros lahorensis: Eichenberger 1970, Enigk & Grittner 1952, Moskwin 1929, Schulze 1941
Ornithodoros moubata: Diehl 1969, 1970, Eichenberger 1970, Enigk & Grittner 1952, Jenni 1971, Malamos 1938, Moskwin 1929, Samson 1909, Schulze 1941, Wagner-Jevseenko 1958, Weyer 1970, Weyer & Mooser 1957
Ornithodoros nicollei: Wagner-Jevseenko 1958
Ornithodoros papillipes: Moskwin 1929, Wagner-Jevseenko 1958
Ornithodoros pavimentosus: Schulze 1941
Ornithodoros rostratus: Enigk & Grittner 1952
Ornithodoros savignyi: Diehl 1970, Eichenberger 1970, Enigk & Grittner 1952, Malamos 1938, Piekarski 1934, Samson 1909, Schulze 1941, Wagner-Jevseenko 1958
Ornithodoros talaje: Schulze 1941
Ornithodoros tartakovskiyi: Eichenberger 1970, Wagner-Jevseenko 1958
Ornithodoros tholozani: Diehl 1970, Moskwin 1929
Ornithodoros turicata: Wagner-Jevseenko 1958, Weyer & Mooser 1957
Otobius megnini: Schulze 1941

Ixodidae

- Amblyocentor circumguttatus*: Schulze 1941

Amblyocentor rhinocerinus: Schulze 1941
Amblyomma agatum: Wagner-Jevseenko 1958
Amblyomma argentiniae: Schulze 1941
Amblyomma aureolatum: Schulze 1941
Amblyomma babirussae: Schulze 1941
Amblyomma brasiliense: Schulze 1941
Amblyomma cohaerens: Schulze 1941
Amblyomma compressum compressum: Schulze 1941
Amblyomma compressum javanense: Schulze 1941
Amblyomma cooperi: Schulze 1941
Amblyomma cuneatum: Schulze 1941
Amblyomma cyprium: Schulze 1935, 1941
Amblyomma cyprium aeratipes: Schulze 1935
Amblyomma dissimile: Schulze 1938, 1941, Wagner-Jevseenko 1958
Amblyomma elegans: Schulze 1941
Amblyomma formosanum: Schulze 1935
Amblyomma fuscum: Schulze 1941
Amblyomma hebraeum: Enigk & Grittner 1952, Schulze 1941
Amblyomma infestum taivanicum: Schulze 1935
Amblyomma infestum testudinarium: Schulze 1941
Amblyomma javanense: Schulze 1934, 1938
Amblyomma lepidum: Schulze 1941
Amblyomma leucozomum: Schulze 1941
Amblyomma longirostre: Schulze 1941
Amblyomma marmoreum: Schulze 1941
Amblyomma paulopunctatum: Schulze 1941
Amblyomma personatum: Schulze 1941
Amblyomma petersi: Schulze 1941
Amblyomma rhinocerotis: Schulze 1941
Amblyomma rotundatum: Schulze 1941
Amblyomma scutatatum: Schulze 1941
Amblyomma splendidum: Schulze 1941
Amblyomma sublaeve: Schulze 1934
Amblyomma testudinarium: Schulze 1935
Amblyomma testudinis: Schulze 1941
Amblyomma variegatum: Enigk & Grittner 1952, Krüger 1935, Ruser 1933, Schulze 1941
Anocentor columbianus: Schulze 1941
Aponomma auruginans: Schulze 1938, 1941
Aponomma exornatum: Schulze 1941
Aponomma fimbriatum: Schulze 1941
Aponomma gervaisi: Schulze 1934, 1941
Aponomma laevatum: Schulze 1941
Aponomma lucasi: Schulze 1934, 1941
Aponomma omissum: Schulze 1941
Aponomma pseudolaeve: Schulze 1941
Aponomma undatum: Schulze 1934, 1941
Boophilus annulatus: Diehl 1970, Enigk & Grittner 1952, Schulze 1941
Boophilus bovis: Piekarski 1934

Boophilus calcaratus: Eichenberger 1970, Enigk & Grittner 1952, Schulze 1941
Boophilus calcaratus balcanicus: Yalvac 1939
Boophilus decoloratus: Enigk & Grittner 1952, Krüger 1935
Boophilus microplus: Diehl 1969, 1970
Ceratixodes putus: Schulze 1941
Ceratixodes uriae: Schulze 1941
Cosmiomma hippopotamense: Schulze 1941
Coxixodes ornithorhynchi: Schulze 1941
Dermacentor albipictus: Schulze 1941
Dermacentor albipictus nigrolineata: Schulze 1941
Dermacentor albipictus nigromaculata: Schulze 1941
Dermacentor andersoni: Gothe 1971a, b, Schulze 1941
Dermacentor atrosignatus: Schulze 1935
Dermacentor marginatus: Enigk & Grittner 1952, Schulze 1941, Wagner-Jevseenko 1958, Weber 1981a
Dermacentor occidentalis: Weyer 1970
Dermacentor pictus: Eichenberger 1970
Dermacentor reticulatus: Wagner-Jevseenko 1958, Weidner 1964
Dermacentor sinicus: Schulze 1941
Dermacentor variabilis: Schulze 1941
Dermacentor venustus: Schulze 1941
Endopalpiger luxuriosus: Schulze 1941
Endopalpiger steini: Schulze 1941
Eschatocephalus vespertilionis: Schulze 1941
Exopalpiger priscicollaris: Schulze 1941
Haemalastor acutitarsus: Nemenz 1968
Haemalastor longirostris: Schulze 1941
Haemaphysalis bartelsi: Schulze 1938
Haemaphysalis birmaniae: Schulze 1935
Haemaphysalis campanulata: Krüger 1935, Schulze 1941
Haemaphysalis concinna: Balát 1964, Wagner-Jevseenko 1958
Haemaphysalis formosensis: Schulze 1935
Haemaphysalis hystricis: Schulze 1935
Haemaphysalis inermis: Gothe 1971b, Schulze 1941
Haemaphysalis koningsbergeri: Schulze 1934, 1938
Haemaphysalis leachi: Enigk & Grittner 1952, Schulze 1941
Haemaphysalis leachi australis: Schulze 1934
Haemaphysalis monospinosa: Schulze 1934
Haemaphysalis otophila: Schulze 1941
Haemaphysalis punctata: Gothe 1971a, b, Mester 1974, Schulze 1938, 1941
Haemaphysalis traguli: Schulze 1934
Haemaphysalis warburtoni: Schulze 1935
Hyalomma aegyptium: Oefele 1901, Oppermann 1935, Samson 1909, Wagner-Jevseenko 1958, Yalvac 1939
Hyalomma anatolicum: Eichenberger 1970, Schulze 1938, 1941, Wagner-Jevseenko 1958, Yalvac 1939
Hyalomma detritum: Eichenberger 1970, Enigk & Grittner 1952
Hyalomma dromedarii: Eichenberger 1970

Hyalomma excavatum: Mester 1974
Hyalomma impressum rufipes: Schulze 1941
Hyalomma marginatum: Mester 1974, Schulze 1938, 1941
Hyalomma marginatum brionicum: Ruser 1933, Schulze 1938
Hyalomma rufipes: Enigk & Grittner 1952
Hyalomma rufipes glabrum: Enigk & Grittner 1952
Hyalomma savignyi: Enigk & Grittner 1952, Schulze 1941
Hyalomma scupense: Ruser 1933
Hyalomma syriacum: Wagner-Jevseenko 1958
Indocentor ater: Schulze 1941
Indocentor atrosignatus: Schulze 1941
Indocentor auratus: Schulze 1934, 1941
Indocentor auratus sumatranus: Schulze 1941
Indocentor bellulus: Schulze 1935
Indocentor compactus tricuspis: Schulze 1935
Indocentor confractus: Schulze 1935
Indocentor confragus: Schulze 1935
Indocentor steini: Schulze 1935
Ixodes acutitarsus: Nemenz 1968, Schulze 1935, 1941
Ixodes apronophorus: Schulze 1941
Ixodes arboricola: Schulze 1941
Ixodes autumnalis: Schulze 1941
Ixodes barbarossae: Schulze 1941
Ixodes brunneus: Putzig 1939
Ixodes calcaratus: Wagner-Jevseenko 1958
Ixodes caledonicus: Schulze 1941
Ixodes collocaliae: Schulze 1941
Ixodes cordifer: Schulze 1938
Ixodes dammini: Ackermann 1983, Cafilisch *et al.* 1984
Ixodes frontalis: Putzig 1939
Ixodes gigas: Nemenz 1968, Schulze 1935, 1941
Ixodes granulatus: Schulze 1934
Ixodes hexagonus: Ruser 1933, Schulze 1941
Ixodes holocyclus: Gothe 1971a, b, Schulze 1938
Ixodes japonensis: Schulze 1941
Ixodes kerri: Nemenz 1968
Ixodes laevis: Nemenz 1968
Ixodes lividus obotriticus: Schulze 1941
Ixodes luxuriosus: Schulze 1938
Ixodes melicola: Schulze 1941
Ixodes moschiferi: Nemenz 1968
Ixodes muntiacci: Schulze 1941
Ixodes nivalis: Ruser 1933, Schulze 1938, 1941
Ixodes ornithorhynchi: Schulze 1941
Ixodes percavatus: Schulze 1941
Ixodes petauristae: Nemenz 1968
Ixodes plumbeus obotriticus: Krüger 1935, Ruser 1933
Ixodes praematurus: Schulze 1941

- Ixodes rarus*: Schulze 1941
- Ixodes reduvius*: Afzelius 1921, Brachtel & Korting 1973, Samson 1909, Wagner-Jevseenko 1958
- Ixodes ricinus*: Abar *et al.* 1977 (both papers), Ackermann 1983, Balát 1964, Bodemann *et al.* 1980, Brachtel & Korting 1973, Caflisch *et al.* 1984, Diehl 1970, Enigk & Grittner 1952, Krüger 1935, Oppermann 1935, Piekarski 1934, Rehse-Küpper *et al.* 1977, Roth 1983, Runne & Ackermann 1984, Ruser 1933, Samson 1909, Schattenbrand 1967, Schulze 1938, 1941, Steigleder 1984, Wagner-Jevseenko 1958, Weber 1981a, Weidner 1964, Weyer 1970, Yalvac 1939
- Ixodes ricinus scapularis*: Schulze 1941
- Ixodes rubicundus*: Gothe 1971b
- Ixodes signatus*: Schulze 1941
- Ixodes spinicoxalis*: Schulze 1934
- Ixodes steini*: Ruser 1933, Schulze 1938
- Ixodes strigicola*: Schulze 1941
- Ixodes succineus*: Weidner 1964
- Ixodes tertiaris*: Weidner 1964
- Ixodes testudinis*: Oppermann 1935
- Ixodes unicavatus*: Schulze 1941
- Margaropus annulatus*: Schulze 1935
- Otocentor nitens*: Schulze 1941
- Palpoboophilus decoloratus*: Schulze 1941
- Reticulinasus steini*: Schulze 1941
- Rhipicephalus appendiculatus*: Schulze 1941
- Rhipicephalus bursa*: Enigk & Grittner 1952, Jenni 1971, Wagner-Jevseenko 1958
- Rhipicephalus evertsi*: Enigk & Grittner 1952, Gothe 1971b
- Rhipicephalus macropis*: Schulze 1941
- Rhipicephalus sanguineus*: Enigk & Grittner 1952, Malamos 1938, Oefele 1901, Schulze 1935, Yalvac 1939
- Rhipicephalus supertritus*: Schulze 1941
- Scaphixodes unicavatus*: Schulze 1941
- Sternalixodes cordifer*: Schulze 1938, 1941
- Sternalixodes holocyclus*: Schulze 1938
- Sternalixodes rossianus*: Schulze 1941
- Uroboophilus caudatus*: Schulze 1941
- Uroboophilus distans*: Schulze 1935
- Uroboophilus sinensis*: Schulze 1935
- Xiphixodes collocaliae*: Schulze 1941
- Nuttalliellidae**
- Nuttalliella namaqua*: Schulze 1941

Acknowledgements

For generously supplying copies of translations in their care, we warmly thank these friends and kindred spirits of Harry Hoogstraal: Drs. William H. Dees, LCDR, U.S. Navy (retired) and Elizabeth A. Dykstra, LT, U.S. Navy, both formerly of NAMRU-3; Drs. Lance A. Durden and James E. Keirans, U.S. National Tick Collection, Institute of Arthropodology and Parasitology, Georgia

Southern University, Statesboro; and Dr. Frederick J. Santana, CAPT, U.S. Navy (retired), formerly of NAMRU-2, Taipei, Taiwan. The opinions and assertions advanced herein are those of the authors and are not to be construed as official or reflecting the views of the U.S. Departments of the Army or Defense.

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Accepted: 24 January 2004
Published: 23 February 2004

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