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REVIEW PAPER

Comments on controversial tick (Acari: Ixodida) species names and species described or resurrected from 2003 to 2008

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Abstract There are numerous discrepancies in recent published lists of the ticks of the world. Here we review the controversial names, presenting evidence for or against their validity and excluding some altogether. We also address spelling errors and present a list of 17 species described or resurrected during the years 2003–2008. We consider the following 35 tick species names to be invalid: *Argas fischeri* Audouin, 1826, *Ornithodoros boliviensis* Kohls and Clifford, 1964, *Ornithodoros steini* (Schulze, 1935), *Amblyomma acutangulatum* Neumann, 1899, *Amblyomma arianae* Keirans and Garris, 1986, *Amblyomma bibroni* (Gervais, 1842), *Amblyomma colasbelcouri* (Santos Dias, 1958), *Amblyomma concolor* Neumann, 1899, *Amblyomma cooperi* Nuttall and Warburton, 1908, *Amblyomma curruca*

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Schulze, 1936, *Amblyomma cyprium* Neumann, 1899, *Amblyomma decorosum* (Koch, 1867), *Amblyomma nocens* Robinson, 1912, *Amblyomma perpunctatum* (Packard, 1869), *Amblyomma striatum* Koch, 1844, *Amblyomma superbum* Santos Dias, 1953, *Amblyomma testudinis* (Conil, 1877), *Amblyomma trinitatis* Turk, 1948, *Dermacentor confractus* (Schulze 1933), *Dermacentor daghestanicus* Olenev, 1928, *Haemaphysalis himalaya* Hoogstraal, 1966, *Haemaphysalis vietnamensis* Hoogstraal and Wilson, 1966, *Hyalomma detritum* Schulze, 1919, *Ixodes apteridis* Maskell, 1897, *Ixodes donarthuri* Santos Dias, 1980, *Ixodes kempi* Nuttall, 1913, *Ixodes neotomae* Cooley, 1944, *Ixodes rangtangensis* Teng, 1973, *Ixodes robertsi* Camicas, Hervy, Adam and Morel, 1998, *Ixodes serrafreirei* Amorim, Gazetta, Bossi and Linhares, 2003, *Ixodes tertiarius* Scudder, 1885, *Ixodes uruguayensis* Kohls and Clifford, 1967, *Ixodes zealandicus* Dumbleton, 1961, *Ixodes zumpti* Arthur, 1960 and *Rhipicephalus camelopardalis* Walker and Wiley, 1959. We consider the following 40 names valid: *Argas delicatus* Neumann, 1910, *Argas vulgaris* Filippova, 1961, *Ornithodoros aragaoi* Fonseca, 1960, *Ornithodoros dugesi* Mazzoti, 1943, *Ornithodoros knoxjonesi* Jones and Clifford, 1972, *Ornithodoros marocanus* Velu, 1919, *Ornithodoros nattereri* Warburton, 1927, *Amblyomma beaurepairei* Vogelsang and Santos Dias, 1953, *Amblyomma crassipes* (Neumann, 1901), *Amblyomma echidnae* Roberts, 1953, *Amblyomma fuscum* Neumann, 1907, *Amblyomma orlovi* (Kolonin, 1995), *Amblyomma parkeri* Fonseca and Aragão, 1952, *Amblyomma pseudoconcolor* Aragão, 1908, *Bothriocroton oudemansi* (Neumann, 1910), *Bothriocroton tachyglossi* (Roberts, 1953), *Dermacentor abaensis* Teng, 1963, *Dermacentor confragus* (Schulze 1933), *Dermacentor ushakovae* Filippova and Panova, 1987, *Haemaphysalis anomaloceraea* Teng, 1984, *Haemaphysalis filippovae* Bolotin, 1979, *Haemaphysalis pavlovskyi* Pospelova-Shtrom, 1935, *Hyalomma excavatum* Koch, 1844, *Hyalomma isaaci* Sharif, 1928, *Hyalomma rufipes* Koch, 1844, *Hyalomma turanicum* Pomerantzev, 1946, *Ixodes arabukiensis* Arthur, 1959, *Ixodes boliviensis* Neumann, 1904, *Ixodes columnae* Takada and Fujita, 1992, *Ixodes maslovi* Emel'yanova and Kozlovskaya, 1967, *Ixodes sachalinensis* Filippova, 1971, *Ixodes siamensis* Kitaoka and Suzuki, 1983, *Ixodes sigelos* Keirans, Clifford and Corwin, 1976, *Ixodes succineus* Weidner, 1964, *Rhipicephalus aurantiacus* Neumann, 1907, *Rhipicephalus cliffordi* Morel, 1965, *Rhipicephalus pilans* Schulze, 1935, *Rhipicephalus pseudolongus* Santos Dias, 1953, *Rhipicephalus serranoi* Santos Dias, 1950 and *Rhipicephalus tetracornus* Kitaoka and Suzuki, 1983.

Keywords Ixodida · Argasidae · Ixodidae · Species names

Introduction

Over the last decade, there have been three attempts to construct complete lists of the world's tick species (Acari: Ixodida: Argasidae, Ixodidae and Nuttalliellidae): Camicas et al. (1998), Horak et al. (2002), and Barker and Murrell (2004). Recently, Nava et al. (2009) joined this endeavor, compiling a list of 879 species (186 in the Argasidae, 692 in the Ixodidae, and 1 in the Nuttalliellidae), commenting on what they consider mistakes in the list of Barker and Murrell (2004), and adding or deleting names based on the argasid list of Keirans (1992) and the ixodid list of Horak et al. (2002). As stated in its preface, the list of Horak et al. (2002) amounts to an exercise in consensus, involving some of the very scientists responsible for previous lists. The compilation by Barker and Murrell (2004) ostensibly sought to capture names that had been overlooked in the works of Keirans (1992), Camicas et al. (1998), Keirans and Robbins (1999), and Horak et al. (2002).

However, Barker and Murrell (2004) also missed several names (e.g., *Argas delicatus* Neumann, 1910, *Amblyomma concolor* Neumann, 1899 and *Ixodes robertsi* Camicas, Hervy, Adam and Morel, 1998) that appear exclusively in Camicas et al. 1998. Clearly, there are numerous disagreements among these lists. Here we discuss all the controversial tick names that have come to our attention, correct a number of common spelling errors, and provide a list of species described or resurrected during the years 2003–2008.

There are several competing phylogenies of the Argasidae and the Ixodidae. Thus, Filippova (1966), Pospelova-Shtrom (1969), Hoogstraal (1985), Klompen and Oliver (1993), and Camicas et al. (1998) offer different arrangements of the genera and subgenera of the Argasidae, while Hoogstraal and Aeschlimann (1982), Black and Piesman (1994), Filippova (1994), Camicas et al. (1998), Barker and Murrell (2002) and Horak et al. (2002), among others, present classifications of the Ixodidae with varying degrees of congruence. The authors of the present paper themselves disagree on the systematic status of several genera, and for this reason we have been compelled to compromise, selecting—but not endorsing—the argasid phylogeny of Hoogstraal (1985), which comprises the genera *Antricola*, *Argas*, *Nothoaspis*, *Ornithodoros*, and *Otobius*, and the ixodid listing of Horak et al. (2002), which recognizes the genera *Amblyomma*, *Anomalohimalaya*, *Bothriocroton*, *Cosmiomma*, *Dermacentor*, *Haemaphysalis*, *Hyalomma*, *Ixodes*, *Margaropus*, *Nosomma*, *Rhipicentor*, and *Rhipicephalus*. Additionally, we include the fossil genus *Cornupalpatum*. Our compilation focuses on species names, and is therefore largely free of phylogenetic argument, but where generic assignments differ from those in Hoogstraal (1985) or Horak et al. (2002), we have discussed them in order to underscore the current divergence of professional opinion. Ongoing research in molecular genetics promises further upheaval in the higher-level classification of ticks and other acarines.

Controversial tick names considered invalid

Argasidae

Argas fischeri Audouin, 1826 is listed as a valid species in Camicas et al. (1998) and in Barker and Murrell (2004) [where it is included in the genus *Carios*] but not in Horak et al. (2002). Hoogstraal (1958) and Filippova (1964) treated *A. fischeri* as a junior synonym of *Argas vespertilionis* Latreille, 1796. Both authors believe that *A. fischeri* may be a valid name, but its resurrection will hinge on comparison of African and European tick populations, and, to the best of our knowledge, such studies have not yet been conducted. We therefore consider *A. fischeri* invalid, at least provisionally.

Ornithodoros boliviensis Kohls and Clifford, 1964 is included in Camicas et al. (1998) [as *Alectorobius boliviensis*] and in Barker and Murrell (2004) but not in Horak et al. (2002). This name is preoccupied by *O. boliviensis* Bacherer Gutiérrez, 1931, a synonym of *Otobius megnini* (Dugès, 1883), and the species was accordingly renamed *O. kohlsi* Guglielmone and Keirans, 2002, as discussed in Guglielmone and Keirans (2002). Horak et al. (2002) included the new specific epithet under the name *Carios kohlsi*, while Barker and Murrell (2004) incorrectly listed both names (*O. boliviensis* and *C. kohlsi*).

Ornithodoros steini (Schulze, 1935) is included in Horak et al. (2002) and in Barker and Murrell (2004) but not in Camicas et al. (1998). This name is a junior synonym of *O. batuensis* Hirst, 1929, as discussed by Klompen et al. (1995), who consider this species to belong to the genus *Carios*, while Camicas et al. (1998) place it in the genus *Alectorobius*. The inclusion of *O. steini* in Horak et al. (2002) and in Barker and Murrell (2004) is surely

an oversight because, according to the phylogeny used by these authors, this species should belong to the genus *Carios*. We agree with Klompen et al. (1995) and consider this name invalid.

Ixodidae

Amblyomma acutangulatum Neumann, 1899 does not appear in Horak et al. (2002) but is cited in Camicas et al. (1998) and in Barker and Murrell (2004). Robinson (1926) inspected the type specimen, which was in poor condition, in the Natural History Museum, London. It was not included in the list of that museum's types published by Keirans and Hillyard (2001) and has probably been lost, making comparison with other species impossible. The descriptions of the female (the only known stage) by Neumann (1899) and Robinson (1926) are not sufficient to confirm the validity of this species, the type of which is said to have been collected in one of the Fiji Islands. We conclude that *A. acutangulatum* is not a valid species.

Amblyomma arianae Keirans and Garris, 1986 is not included in Camicas et al. (1998) or Horak et al. (2002) but is listed in Barker and Murrell (2004). *Amblyomma arianae* is a junior synonym of *Amblyomma quadricavum* (Schulze, 1941), as discussed in Keirans and Klompen (1996). Barker and Murrell (2004) incorrectly listed both names.

Amblyomma bibroni (Gervais, 1842) is included in Camicas et al. (1998) and in Barker and Murrell (2004) but not in Horak et al. (2002). As discussed in Guglielmone et al. (2003), Santos Dias (1958), and Camicas et al. (1998) considered *A. dissimile* Koch, 1844 a synonym of *A. bibroni*—originally *Ixodes bibronii*—but no type comparison was attempted. Moreover, Estrada-Peña and Castellá (1994) stated that *I. bibroni* Gervais, 1842 is a name lacking a formal description. And while Gervais (1844) briefly summarized his new species, he confused the issue by stating that his specimens were collected in 1843 (page 249). This lack of clarity or any subsequent redescription of the type material has led us to doubt the validity of *A. bibroni*, at least for the time being. Barker and Murrell (2004) incorrectly listed both *A. bibroni* and *A. dissimile*.

Amblyomma colasbelcouri (Santos Dias, 1958) is listed as a valid name in Barker and Murrell (2004) but not in Camicas et al. (1998) or Horak et al. (2002). This name was originally applied to a species in the former genus *Aponomma* but was subsequently recognized to belong in *Haemaphysalis* (Petney and Keirans 1996). Therefore, the valid name for this tick is actually *H. colasbelcouri* (Santos Dias, 1958). Barker and Murrell (2004) incorrectly included both *A. colasbelcouri* and *H. colasbelcouri* as valid tick names.

Amblyomma concolor Neumann, 1899 is considered a valid species by Camicas et al. (1998) but not by Horak et al. (2002) or Barker and Murrell (2004). Keirans and Hillyard (2001) examined a syntype (female) and concluded that *A. concolor* is a junior synonym of *A. auricularium* (Conil, 1878).

Amblyomma cooperi Nuttall and Warburton, 1908 is included in Barker and Murrell (2004) but not in the other two lists. This name is a junior synonym of *A. dubitatum* Neumann, 1899, as discussed in Estrada-Peña et al. (2002), who examined the type (female). Barker and Murrell (2004) incorrectly included both these names in their list.

Amblyomma curruca Schulze, 1936 is included in Camicas et al. (1998) and Barker and Murrell (2004) [where it is spelled *curraca*] but not in Horak et al. (2002). However, examination of the type showed that this name is a junior synonym of *A. auricularium* (Conil, 1878) [Fairchild et al. 1966; D.M. Barros-Battesti, personal communication].

Amblyomma cyprium Neumann, 1899 is included in Barker and Murrell (2004) but not in Camicas et al. (1998) or Horak et al. (2002). Keirans, in Voltzit and Keirans (2002),

determined that the types of *A. cyprium* and *A. breviscutatum* Neumann, 1899 are conspecific, and since *A. breviscutatum* has page priority over *A. cyprium*, the latter falls as a junior synonym (see also Santos Dias 1956). Barker and Murrell (2004) listed *A. breviscutatum* and *A. cyprium* without justifying their position.

Amblyomma decorosum (Koch, 1867) is included in Camicas et al. (1998) [as a member of the genus *Aponomma*] and Barker and Murrell (2004) but not in Horak et al. (2002). This name was reduced to a junior synonym of *Bothriocroton undatum* (Fabricius, 1775) by Klompen et al. (2002).

Amblyomma nocens Robinson, 1912 is not included in Horak et al. (2002) but appears in the lists of Camicas et al. (1998) and Barker and Murrell (2004). This name is a junior synonym of *A. pomposum* Dönitz, 1909, as determined by Keirans and Hillyard (2001), who examined a syntype (male).

Amblyomma perpunctatum (Packard, 1869) is included in Camicas et al. (1998) and Barker and Murrell (2004) but not in Horak et al. (2002). Camicas et al. (1998) agree with Santos Dias (1961) in considering *A. geayi* Neumann, 1899 a junior synonym of *A. perpunctatum*, but this view was not accepted by Fairchild et al. (1966), who claimed that Packard's (1869) description was inadequate. We provisionally agree with the last opinion, pending comparison of the types. In any event, there is currently no justification for Barker and Murrell's (2004) listing of both *A. perpunctatum* and *A. geayi*.

Amblyomma striatum Koch, 1844 is included in Barker and Murrell (2004) but not in Camicas et al. (1998) or Horak et al. (2002). This name is a junior synonym of *A. aureolatum* (Pallas, 1772), as discussed by Aragão and da Fonseca (1961b). Barker and Murrell (2004) incorrectly listed both *A. aureolatum* and *A. striatum* as valid names.

Amblyomma superbum Santos Dias, 1953 is treated as a valid name in Camicas et al. (1998) and in Barker and Murrell (2004) but not in Horak et al. (2002). Walker and Olwage (1987) consider this species a junior synonym of *A. pomposum*, a view that conflicts with Santos Dias (Walker and Olwage 1987) but is supported by Voltzit and Keirans (2003), who reduced this name to *A. supurbum* (n. syn.), a misspelling.

Amblyomma testudinis (Conil, 1877) is included in Barker and Murrell (2004) but not in Camicas et al. (1998) or Horak et al. (2002). This name is a junior synonym of *A. argentinae* Neumann, 1904, having been originally described as *Ixodes testudinis* Conil, 1877, a name preoccupied by *I. testudinis* Leydig, 1855, which is a synonym of *Hyalomma aegyptium* (Linnaeus, 1758), as discussed in Guglielmone et al. (2001). Barker and Murrell (2004) incorrectly listed both *A. argentinae* and *A. testudinis*.

Amblyomma trinitatis Turk, 1948 is included in Barker and Murrell (2004) [spelled as *trinitatus*] and Camicas et al. (1998) but not in Horak et al. (2002). This name is a junior synonym of *A. dissimile*, as determined by Keirans and Hillyard (2001).

Dermacentor confractus (Schulze 1933) is listed in Barker and Murrell (2004) and in Camicas et al. (1998) but not in Horak et al. (2002). Schulze (1933) described this species as *Indocentor confractus* Schulze 1933 and *Indocentor confragus* Schulze 1933 (vide infra), but later (Schulze 1935) maintained that the correct name was *confragus*. We reject the name *confractus*.

Dermacentor daghestanicus Olenev, 1928, is included in Barker and Murrell (2004) and in Camicas et al. (1998) but not in Horak et al. (2002). This name is a junior synonym of *D. niveus* Neumann, 1897, as noted by Filippova (1997).

Haemaphysalis himalaya Hoogstraal, 1966 is treated as a valid species in Barker and Murrell (2004) but not in Horak et al. (2002). It is considered a junior synonym of *H. sundrai* Sharif, 1928 by Camicas et al. (1998), which accords with the opinion of Hoogstraal and Kim (1985).

Haemaphysalis vietnamensis Hoogstraal and Wilson, 1966, is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is considered a synonym of *H. colasbelcouri* (Santos Dias 1958) by Camicas et al. (1998). J. E. Keirans (personal communication to I. G. Horak) agrees with Camicas et al. (1998), and we have also concluded that *H. vietnamensis* is not a valid species.

Hyalomma detritum Schulze, 1919 is treated as a valid species in all three recent tick checklists, when, in actuality, this name is a junior synonym of *H. scupense* Schulze, 1919, a reversal of the checklist classifications (Filippova 2003). Filippova (2003) considers 1918 the year of publication of *H. scupense*, but in fact the description of this species was printed in 1919 (Hoogstraal 1956). *Hyalomma scupense* is an economically important tick species that is widely known in the West as *H. detritum*. Therefore, to avoid confusing workers who only use the name *H. detritum*, we propose writing "*H. scupense* (= *H. detritum*)" when referring to this tick species.

Ixodes apteridis Maskell, 1897 is listed as a valid taxon under the name *Scaphixodes apteridis* by Camicas et al. (1998), who treat *I. anatis* Chilton, 1904 as a junior synonym. Barker and Murrell (2004) list both *I. anatis* and *I. apteridis* as valid, but Horak et al. (2002) recognize only *I. anatis*. Dumbleton (1953) discussed this problem and noted that *I. apteridis* has priority. However, he concluded that *I. anatis* should be retained because the types of *I. apteridis* were lost and the species could not be determined from the published description. We consider *I. apteridis* a *nomen nudum*.

Ixodes donarthuri Santos Dias, 1980 is considered a valid taxon in Camicas et al. (1998) and in Barker and Murrell (2004) but not in Horak et al. (2002). Keirans and Hillyard (2001) examined a paratype of *I. donarthuri* and concluded that this name is a junior synonym of *I. neitzi* Clifford, Walker and Keirans, 1977.

Ixodes kempi Nuttall, 1913 is considered a valid taxon by Camicas et al. (1998) and Barker and Murrell (2004) but not by Horak et al. (2002). Keirans and Brewster (1981) examined the lectotype and paralectotypes and concluded that *I. kempi* is a junior synonym of *I. granulatus* Supino, 1897.

Ixodes neotomae Cooley, 1944 is considered a valid species in Camicas et al. (1998) and in Barker and Murrell (2004) but not in Horak et al. (2002). This name is a junior synonym of *I. spinipalpis* Hawden and Nuttall, 1916, as determined by Norris et al. (1997) after careful study.

Ixodes rangtangensis Teng, 1973 is listed as a junior synonym of *I. moschiferi* Nemenz, 1968 in Camicas et al. (1998) but is accorded species rank in Horak et al. (2002) and in Barker and Murrell (2004). Later, Teng (1986) concluded that *I. rangtangensis* is a synonym of *I. moschiferi*, and we accept this decision.

Ixodes robertsi Camicas, Hervy, Adam and Morel, 1998 is listed as a *nomen novum* in Camicas et al. (1998) but is ignored in Horak et al. (2002) and in Barker and Murrell (2004). Camicas et al. (1998) applied this name to *I. cornuatus* Roberts, 1960, which they considered preoccupied by *I. cornuatus* Olenev (1941). However, J. E. Keirans (personal communication to I. G. Horak) considers *I. cornuatus* Olenev a *nomen nudum*, thus validating the species described by Roberts (1960). Olenev (1941) provided no formal description of *I. cornuatus* (which he proposed as a new variety of *I. persulcatus*), and we therefore concur that there is no argument for the validity of *I. robertsi*.

Ixodes serrafreirei Amorim, Gazeta, Bossi and Linhares, 2003 was inadequately described (Amorim et al. 2003) and is thus a *nomen nudum* (Venzal et al. 2008b).

Ixodes tertiarius Scudder, 1885 is the name for a fossil tick species. It is not included in either Horak et al. (2002) or Barker and Murrell (2004); however, Camicas et al. (1998) listed this name under the heading "fossil taxa" without further elaboration. We were

unable to examine the original description in "Scudder, S.H. 1885. A contribution to our knowledge of Paleozoic arachnids. Proc. Am. Acad. Sci. (ser. 2), 12" as described in Weidner (1964), but found this name, without formal description but accompanied by a figure, in Scudder (1885); there is also a brief description of *I. tertiarius* in Scudder (1890). The figure and description provide no help in determining the genus of this tick. We therefore consider *I. tertarius* a *nomen nudum*. It would be worthwhile to locate this fossil, whose study may shed light on tick evolution.

Ixodes uruguayensis Kohls and Clifford, 1967 is included in Camicas et al. (1998) and in Barker and Murrell (2004) but not in Horak et al. (2002). This name is a junior synonym of *I. longiscutatus* Boero, 1944, as discussed in Venzal et al. (2001), who demonstrated that the larvae and nymphs of *I. uruguayensis* (the only known stages of this tick) are in fact the immature stages of *I. longiscutatus*. Barker and Murrell (2004) incorrectly listed both names.

Ixodes zealandicus Dumbleton, 1961, is considered valid in Camicas et al. (1998) and in Barker and Murrell (2004) but is listed as a subspecies of *I. auritulus* Neumann, 1904 in Horak et al. (2002). All these authors erroneously cite 1953 as the year of description of *zealandicus*. Barros-Battesti et al. (2003) described a new species in the subgenus *Multidentatus*, to which *I. auritulus* belongs, and also treat the name *zealandicus* as a subspecies of *I. auritulus*. We provisionally agree.

Ixodes zumpti Arthur, 1960 is listed as a junior synonym of *I. kerguelenensis* André and Colas-Belcour, 1942 in Camicas et al. (1998) but as a full species in Horak et al. (2002) and in Barker and Murrell (2004). Arthur (1965) stated that the female of *I. zumpti* is similar to that of *I. kerguelenensis*, but convincing evidence of their synonym was provided by Wilson (1970), and we therefore consider *I. zumpti* to be an invalid species name.

Rhipicephalus camelopardalis Walker and Wiley, 1959 is considered a valid species in Camicas et al. (1998) but not in Horak et al. (2002) or Barker and Murrell (2004). Walker et al. (2000) examined the types of both species and determined that *R. camelopardalis* is a junior synonym of *R. longicoxatus* Neumann, 1905.

Controversial tick names considered valid

Argasidae

Argas vulgaris Filippova, 1961 is listed as "?= *Argas delicatus* Neumann, 1910" in Camicas et al. (1998), Horak et al. (2002) and Barker and Murrell (2004). Camicas et al. (1998) also list *Argas delicatus* Neumann, 1910 as "cf.? *Argas vulgaris* Filippova, 1961." Both species appear to be closely related, but, unlike *A. delicatus*, the name *A. vulgaris* has been extensively used. *Argas delicatus* was included in the subgenus *Argas* by Kaiser et al. (1964). We have been unable to locate any type comparison in the literature and consider both names valid, pending further investigation.

Ornithodoros aragaoi Fonseca, 1960 is included as a valid species in the genus *Carios* in Horak et al. (2002) and Barker and Murrell (2004), while Camicas et al. (1998) consider it a probable junior synonym of *O. rudis* Karsch, 1880, which they regard as a member of the genus *Alectorobius*. Guglielmone et al. (2003) do not include this taxon in their list of Neotropical ticks. Darci M. Barros-Battesti (personal communication) examined the type material deposited in the Instituto Butantan (São Paulo, Brazil) but was unable to confirm the synonymy in Camicas et al. (1998). We consider *O. aragaoi* provisionally valid until type comparison demonstrates otherwise.

Ornithodoros dugesi Mazzoti, 1943 is generally considered a junior synonym of *O. talaje* (Guérin-Méneville, 1849), and is classified in the genus *Alectorobius* in Camicas et al. (1998) and *Carios* in Horak et al. (2002) and Barker and Murrell (2004). This view is not shared by Butler and Gibbs (1984). After studying larvae of the *O. talaje* species group, J.M. Venzal et al. (2008a) concluded that a new species is present within this group and that *O. dugesi* may be valid. We provisionally accept this conclusion.

Ornithodoros knoxjonesi Jones and Clifford, 1972 is thought to be a junior synonym of *O. dyeri* Cooley and Kohls, 1944, in Camicas et al. (1998) but these authors provide no evidence justifying their position. This species is considered valid in Horak et al. (2002) and in Barker and Murrell (2004). Jones and Clifford (1972) described differences in larval chaetotaxy and other morphological features. We therefore tentatively regard *O. knoxjonesi* as a valid name.

Ornithodoros marocanus Velu, 1919, is treated as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but as a junior synonym of *O. erraticus* (Lucas, 1849) in Camicas et al. (1998), who place this species in the genus *Alectorobius*. We have found no published type comparison between these taxa, and we therefore provisionally accept both as valid species.

Ornithodoros nattereri Warburton, 1927 is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is classified as a junior synonym of *O. rostratus* Aragão, 1911 in Camicas et al. (1998). However, Aragão and da Fonseca (1961a) were able to morphologically separate these species. We tentatively consider *O. nattereri* a valid name.

Ixodidae

Amblyomma beaurepairei Vogelsang and Santos Dias, 1953 is included in Camicas et al. (1998) but not in Horak et al. (2002) and Barker and Murrell (2004). Guglielmone et al. (2003) treat this species as valid in their list of Neotropical ticks and consider *A. beaurepairei* to be close to *A. inornatum* (Banks, 1909) and *A. auricularium* (Conil, 1878). Jones et al. (1972) were unable to locate the types of this species, and Prof. Roy Meléndez (personal communication) recently reported another unsuccessful search for the types. The description of this species by Vogelsang and Santos Dias (1953) is adequate but in the absence of types we are considering *A. beaurepairei* tentatively valid.

Amblyomma crassipes (Neumann, 1901) [formerly *Aponomma*] is treated as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is considered a junior synonym of *Aponomma fuscolineatum* (Lucas, 1847) in Camicas et al. (1998). Kaufman (1972) stated that both species are similar but preferred to maintain their separate status because so little material was available for examination and the types had not been compared.

Amblyomma echidnae Roberts, 1953 is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is classified as a junior synonym of *A. australiense* Neumann, 1905 in Camicas et al. (1998). Roberts (1970) refers to small differences between these taxa and leaves open the possibility that *A. echidnae* is a subspecies of *A. australiense*. We tentatively consider *A. echidnae* valid, pending clarification of its status.

Amblyomma fuscum Neumann, 1907 is considered valid in Camicas et al. (1998) and in Barker and Murrell (2004) but not in Horak et al. (2002). This taxon is included in the list of Neotropical ticks by Guglielmone et al. (2003), and Barros-Battesti et al. (2005) clearly demonstrated its validity.

Amblyomma orlovi (Kolonin, 1995) is considered a valid species by Camicas et al. (1998) [under the genus *Aponomma*], Horak et al. (2002) and Barker and Murrell (2004). It was originally described from Vietnam (Kolonin 1995), but later Kolonin (2003) concluded that his specimens of *A. orlovi* had originated in tropical West Africa. While we tentatively consider *A. orlovi* a valid name, our reading of the original description strongly suggests that this species is a junior synonym of *A. transversale* (Lucas, 1844).

Amblyomma parkeri Fonseca and Aragão, 1952 is considered valid in Camicas et al. (1998) and in Barker and Murrell (2004) but not in Horak et al. (2002). Guglielmone et al. (2003) included it in their list of Neotropical tick taxa, and its status has since been validated by morphological and molecular studies that will be published soon (Marcelo B. Labruna, personal communication).

Amblyomma pseudoconcolor Aragão, 1908 is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is consigned to the synonymy of *A. auricularium* (Conil, 1878) in Camicas et al. (1998). While it is true that males of both species are sometimes difficult to differentiate because the scutal ornamentation (a crucial diagnostic character) is often indistinct in *A. pseudoconcolor* (Jones et al., 1972), females can easily be separated. Moreover, 16S rDNA sequences show differences between the two taxa (Nava et al., 2008).

Bothriocroton oudemansi (Neumann, 1910) is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004). Camicas et al. (1998) followed Kaufman (1972) in considering this name a junior synonym of *Bothriocroton concolor* (Neumann, 1899) (originally *Aponomma concolor*) but Beati et al. (2008) presented convincing evidence for the validity of *B. oudemansi*.

Bothriocroton tachyglossi (Roberts, 1953) [n. syn.] is considered a synonym of *Bothriocroton hydrosauri* (Denny, 1843) by Camicas et al. (1998) [under the genus *Aponomma*], but Andrews et al. (2006) soundly resurrected the species, again as an *Aponomma*.

Dermacentor abaensis Teng, 1963 is considered valid in Camicas et al. (1998), Horak et al. (2002) and Barker and Murrell (2004). However, Hoogstraal (footnote in English translation of Teng 1963) considered this species to be *D. everestianus* Hirst, 1926. Robbins and Robbins (2003) also treat *D. abaensis* as a junior synonym of *D. everestianus*, but because no definitive study supports this synonymy, we are tentatively accepting *D. abaensis* as valid.

Dermacentor confragus (Schulze 1933), originally described as *Indocentor confragus* Schulze 1933, and concurrently as *Indocentor confractus* Schulze 1933 (vide supra), was until recently a "lost" taxon. However, one of us (TNP) has located the types of this species in the Zoological Museum, Berlin, Germany. Pending studies of this material, we are considering *D. confragus* valid.

Dermacentor ushakovae Filippova and Panova, 1987 is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but as a junior synonym of *D. niveus* Neumann, 1897 in Camicas et al. (1998). Filippova (1997) regards *D. ushakovae* as valid, but one of us (AEP) thinks it probable that this species is a junior synonym of *D. marginatus* (Sulzer, 1776). We provisionally accept *D. ushakovae* until type comparisons clarify the situation.

Haemaphysalis anomaloceraea Teng, 1984 is treated as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is listed as a synonym of *H. shimoga* Trapido and Hoogstraal, 1964 in Camicas et al. (1998). However, Keirans and Robbins (1999) support the validity of this species, and we agree because we have been unable to find any grounds for synonymization.

Haemaphysalis filippovae Bolotin, 1979 is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is considered a synonym of *H. concinna* Koch, 1844 in Camicas et al. (1998), who regard *H. filippovae* as a "forme anormale". Filippova (1997) redescribed both taxa, and Keirans and Robbins (1999) do not question the validity of this species. Accordingly, we consider *H. filippovae* a good name.

Haemaphysalis pavlovskyi Pospelova-Shtrom, 1935, is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is considered a junior synonym of *H. doenitzi* Warburton and Nuttall, 1909 by Camicas et al. (1998). However, the redescription of *H. doenitzi* by Hoogstraal and Wassef (1973) and that of *H. pavlovskyi* by Filippova (1997), which includes drawings of the holotype, argue for the validity of both species.

Hyalomma excavatum Koch, 1844, is recognized as a subspecies of *H. anatolicum* by Camicas et al. (1998) and Horak et al. (2002) but is not included in Barker and Murrell (2004). This species was validated and reinstated by Apanaskevich and Horak (2005).

Hyalomma isaaci Sharif, 1928, recognized as a subspecies of *H. marginatum* by Camicas et al. (1998) and Horak et al. (2002) but ignored in Barker and Murrell (2004), was validated and reinstated as a full species by Apanaskevich and Horak (2008).

Hyalomma rufipes Koch, 1844, is considered a valid species by Barker and Murrell (2004) but a subspecies of *H. marginatum* Koch, 1844 by Camicas et al. (1998) and by Horak et al. (2002). Recently, Apanaskevich and Horak (2008) soundly validated this species.

Hyalomma turanicum Pomerantzev, 1946, is included in Horak et al. (2002) and in Barker and Murrell (2004) but not in Camicas et al. (1998), where it is listed as a subspecies of *H. marginatum*. Recently, Apanaskevich and Horak (2008) presented convincing evidence of this species' validity.

Ixodes arabukiensis Arthur, 1959 and *I. djaronensis* Neumann, 1907 are both considered valid in Horak et al. (2002) and Barker and Murrell (2004), but Camicas et al. (1998) list *arabukiensis* as a synonym of *djaronensis*. Females of both species differ in hypostomal dentition, but no type comparison has been conducted. We tentatively regard *I. arabukiensis* as a valid species.

Ixodes boliviensis Neumann, 1904 is treated as a junior synonym of *I. diversifossus* Neumann, 1899 by Camicas et al. (1998) but is listed as valid by Horak et al. (2002) and Barker and Murrell (2004). Keirans and Clifford (1978) commented on the similarity of these species, noting that *I. diversifossus* differs only in its possession of large lateral carinae. We provisionally maintain the validity of *I. boliviensis*, pending a comparison of types.

Ixodes columnae Takada and Fujita, 1992 is not mentioned in Camicas et al. (1998) but is listed in Horak et al. (2002) and in Barker and Murrell (2004). The taxonomic validity of this species is certain.

Ixodes maslovi Emel'yanova and Kozlovskaya, 1967 is listed as a valid species in Horak et al. (2002) and in Barker and Murrell (2004) but is relegated to the synonymy of *I. persulcatus* Schulze, 1930 in Camicas et al. (1998). Filippova (1977) redescribed both species, and because we have found no sound information supporting the position of Camicas et al. (1998), we provisionally consider *I. maslovi* a valid taxon.

Ixodes sachalinensis Filippova, 1971 is also listed as a junior synonym of *I. persulcatus* Schulze, 1930 in Camicas et al. (1998) but is accorded species status in Horak et al. (2002) and Barker and Murrell (2004). Again, we have found no sound information affirming the classification of Camicas et al. (1998), and therefore we provisionally consider *I. sachalinensis* to be a valid species.

Ixodes siamensis Kitaoka and Suzuki, 1983 is treated as a junior synonym of *I. ovatus* Neumann, 1899 in Camicas et al. (1998) but as a valid species in Horak et al. (2002) and Barker and Murrell (2004). Petney and Keirans (1994) doubt the validity of this species, while Keirans and Robbins (1999) list it as valid. We tentatively agree with the last-named authors, but a revision of the *I. ovatus* group, as proposed by Hoogstraal et al. (1973), is clearly in order.

Ixodes sigelos Keirans, Clifford and Corwin, 1976 is listed as a junior synonym of *I. abrocomae* Lahille, 1916 by Camicas et al. (1998) but is accepted as valid by Horak et al. (2002) and Barker and Murrell (2004). Lahille (1916) described the male (other stages unknown) of *I. abrocomae*, and Keirans et al. (1976) described the female, nymph and larva of *I. sigelos* (male unknown). To our knowledge, no further descriptions of these tick species have been published. Therefore, the synonymy of Camicas et al. (1998) appears to be unjustified and we consider *I. sigelos* valid.

Ixodes succineus Weidner, 1964 is a fossil species close to *I. ricinus* (Linnaeus, 1758) that is listed by Camicas et al. (1998) but is ignored by Horak et al. (2002) and by Barker and Murrell (2004), although the latter authors include names for other fossil tick taxa. We find no reason to consider this name invalid.

Rhipicephalus aurantiacus Neumann, 1907 is considered a valid name in Camicas et al. (1998) but not in Horak et al. (2002) or Barker and Murrell (2004). Walker et al. (2000) consider this name a junior synonym of *R. ziemanni* Neumann, 1904, but in their discussion of the latter species the situation is less clear because the types were not examined and the authors state that further studies are needed. We therefore provisionally regard *R. aurantiacus* as valid until types can be compared.

Rhipicephalus cliffordi Morel, 1965 is considered a valid name in Camicas et al. (1998) but not in Horak et al. (2002) or Barker and Murrell (2004). Walker et al. (2000) reduced this name to a junior synonym of *R. pseudolongus* Santos Dias, 1953. Once again, however, the types of these and related species were not compared. We therefore consider *R. cliffordi* to be a valid name, pending type comparisons.

Rhipicephalus pilans Schulze, 1935 is considered a subspecies of *R. haemaphysaloides* Supino, 1897 in Camicas et al. (1998) but is listed as a full species in Horak et al. (2002) and Barker and Murrell (2004). Walker et al. (2000) clearly delineated the differences between *R. pilans* and *R. haemaphysaloides*, and we agree with their assessment.

Rhipicephalus pseudolongus Santos Dias, 1953 is treated as a junior synonym of *R. longus* Neumann, 1907 in Camicas et al. (1998) but as a valid species in Horak et al. (2002) and Barker and Murrell (2004). Walker et al. (2000) clearly described the taxonomic history of this species and consider it provisionally valid until a type comparison can be made.

Rhipicephalus serranoi Santos Dias, 1950 is listed as a synonym of *R. punctatus* Warburton, 1912 by Camicas et al. (1998) but as a valid species by Horak et al. (2002) and Barker and Murrell (2004). Walker et al. (2000) treated *R. serranoi* as a valid species and described its morphological characteristics.

Rhipicephalus tetracornus Kitaoka and Suzuki, 1983 is considered valid in Camicas et al. (1998) but not in Horak et al. (2002) or Barker and Murrell (2004). All adults and some of the nymphs and larvae of this species were lost while being shipped for illustration; therefore, Walker et al. (2000) have elected to treat *R. tetracornus* as a species *incertae sedis* until new material becomes available. However, the description in Kitaoka and Suzuki (1983) is sound and a holotype nymph exists in the National Science Museum, Natural History Institute, Shinjuku, Tokyo. Since no claim has been made that *R. tetracornus* is a synonym of other *Rhipicephalus* species, we accept *R. tetracornus* as valid.

Spelling discrepancies in names of tick species

Haemaphysalis quinghaiensis Teng, 1980 is spelled *qinghaiensis* by Horak et al. (2002) and Barker and Murrell (2004) and even in Teng's original description (Teng 1980). Nonetheless, Latin grammar dictates that the correct spelling for this species is *quinghaiensis*, as recorded in Camicas et al. (1998).

Ixodes kaschmiricus Pomerantzev, 1948 is spelled *I. kashimiricus* in Horak et al. (2002) and Barker and Murrell (2004), but *I. kaschmiricus* in Pomerantzev (1948), Hoogstraal (1970), and Camicas et al. (1998). We have concluded that Pomerantzev's original (Pomerantzev 1948) spelling is correct.

Ixodes pomeranzevi Serdyukova, 1941 is spelled *I. pomerantzevi* by several authors, including Clifford et al. (1973), and Robbins and Keirans (1992), but the correct spelling for this species is *I. pomeranzevi*, as published by Serdyukova (1941), Camicas et al. (1998) [under the genus *Pholeoixodes*], Horak et al. (2002), and Barker and Murrell (2004).

Ixodes paranaensis Barros-Battesti, Arzua, Pichorim and Keirans, 2003 is spelled *I. paranensis* in Barker and Murrell (2004).

See also *Amblyomma curruca* and *Amblyomma trinitatis* in the list of invalid tick names.

Names for new or resurrected species (2003–2008)

Antricola delacruzi Estrada-Peña, Barros-Battesti and Venzal, 2004.

Antricola guglielmonei Estrada-Peña, Barros-Battesti and Venzal, 2004.

Antricola inexpectata Estrada-Peña, Barros-Battesti and Venzal, 2004.

Argas keiransi Estrada-Peña, Venzal and González-Acuña, 2003.

Carios rondoniensis Labruna et al. 2008. The morphological and molecular relationships of this species to the type taxon of the genus, *Carios vespertilionis* Latreille, 1796, are ambiguous. Other authors likely will classify this species in the genera *Alectorobius* or *Ornithodoros.*

Ornithodoros rioplatensis Venzal, Estrada-Peña and Mangold, 2008. As in the case of *Carios rondoniensis*, this new species may be considered by different workers to belong to *Alectorobius* or *Carios.*

Amblyomma latepunctatum Tonelli-Rondelli, 1939. A species that was long confused with *A. incisum* Neumann, 1906 and *A. scalpturatum* Neumann, 1906 but that was compellingly resurrected by Labruna et al. (2005).

Amblyomma romitii Tonelli-Rondelli, 1939. This species had been considered a junior synonym of *A. extraoculatum* Neumann, 1899 but was definitively resurrected by Barros-Battesti et al. (2007).

Bothriocroton tachyglossi (Roberts, 1953). See *Bothriocroton tachyglossi* in "Controversial tick names considered valid".

Haemaphysalis colesbergensis Apanaskevich and Horak, 2008.

Haemaphysalis knobigera Prakasan and Ramani 2007. The original description and illustrations of this species are very poor; moreover, given the long history of *Haemaphysalis* studies in India (Trapido et al. 1964; Hoogstraal and Kim 1985), it seems unlikely that a new member of this genus would be found on domestic stock (cows and goats). Therefore, while we are listing this name for the sake of completeness, we strongly doubt its validity.

Haemaphysalis oliveri Apanaskevich and Horak, 2008.

Hyalomma glabrum Delpy, 1949. Apanaskevich and Horak (2006) demonstrated that the African populations of *Hyalomma turanicum* correspond to the resurrected species *H. glabrum*.

Hyalomma isaaci Sharif, 1928. See *Hyalomma isaaci* in "Controversial tick names considered valid."

Ixodes dicei Keirans and Ajohda, 2003.

Ixodes paranaensis Barros-Battesti, Arzua, Pichorim and Keirans, 2003.

Nosomma keralensis Prakasan and Ramani 2007. The original description and illustrations of this supposedly second species of *Nosomma* are very poor; moreover, it seems unlikely that a new member of this striking and otherwise monotypic genus would be found on domestic stock (buffalo), and the character states used to differentiate this taxon from *N. monstrosum* (Nuttall and Warburton 1908)—the extent of ornamentation and the degree of punctation—are highly variable. Therefore, while we are listing this name for the sake of inclusiveness, we strongly doubt its validity.

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