



NEW ZEALAND BIOSECURE

Entomology Laboratory



Profile: *Haemaphysalis longicornis* Neumann, 1901

Common Name: cattle tick (also known as the scrub or bush tick)

Family: Ixodidae

Origin: Introduced and established



Adult female dorsal view

Capitulum & scutum

Geographic Distribution: The distribution of this tick is restricted to more temperate areas, being found in Australia, New Zealand, Fiji, New Caledonia, Hawaii, China, former USSR, Korea and Japan (Hoogstraal *et al.* 1968; Roberts 1970), western Samoa (Steele 1977), New Hebrides/Vanuatu and Tonga.

Australia – A localised population occurs in Western Australia (Besier & Wroth 1985) and more commonly in south eastern Queensland, abundant in some elevated areas such as Tamborine, Buderim and Maleny; New South Wales - it is abundant in northern coastal areas particularly between Taree and Wauchope and exists in southern coastal areas to the Victorian border with the odd specimen found inland at Tenterfield, Mudgee, Inverell and Young; Victoria – rare occurrences only in some areas (Bairnsdale-Wy Yung and Wodonga-Tallangatta) (Roberts 1970).

New Zealand – *H. longicornis* became established in north Auckland before 1910 (possibly in the late 19th century) and is now widespread throughout the northern half of the North Island as far south as Hastings and Foxton (Dumbleton 1953), Waikanae (Heath 1998) and at the top of the South Island within the Golden Bay area (Heath 1977). Locations for specimens held in Museum of New Zealand Te Papa Tongarewa include; Moturoa Island, Tangiteroria, Dargaville, Tokoroa-Hamilton Road, Ohiwa Harbour, Rotorua and Wairoa. Specimen locations for the New Zealand Arthropod Collection (NZAC) include; Spirits Bay, Te Hapua, Kaitaia, Ahipara, Kawerua,

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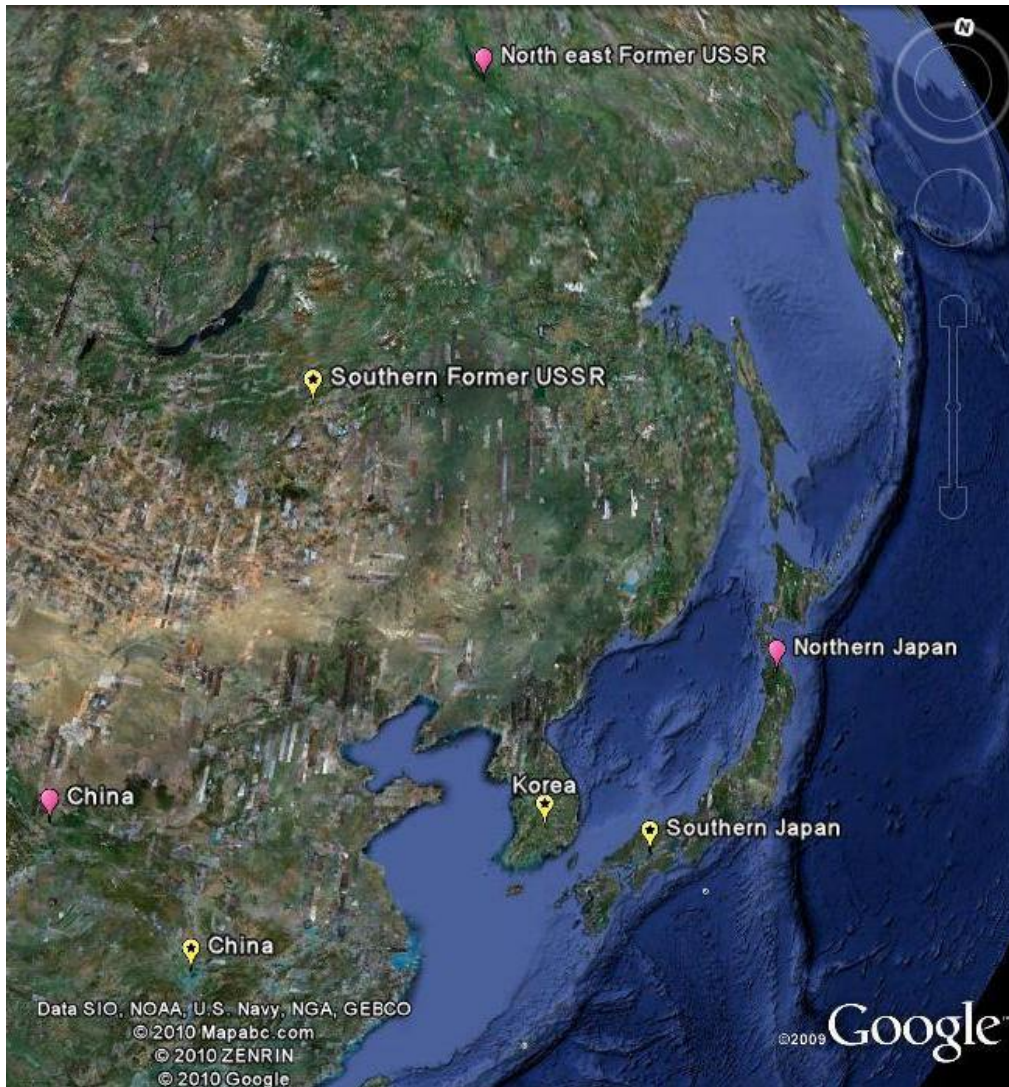
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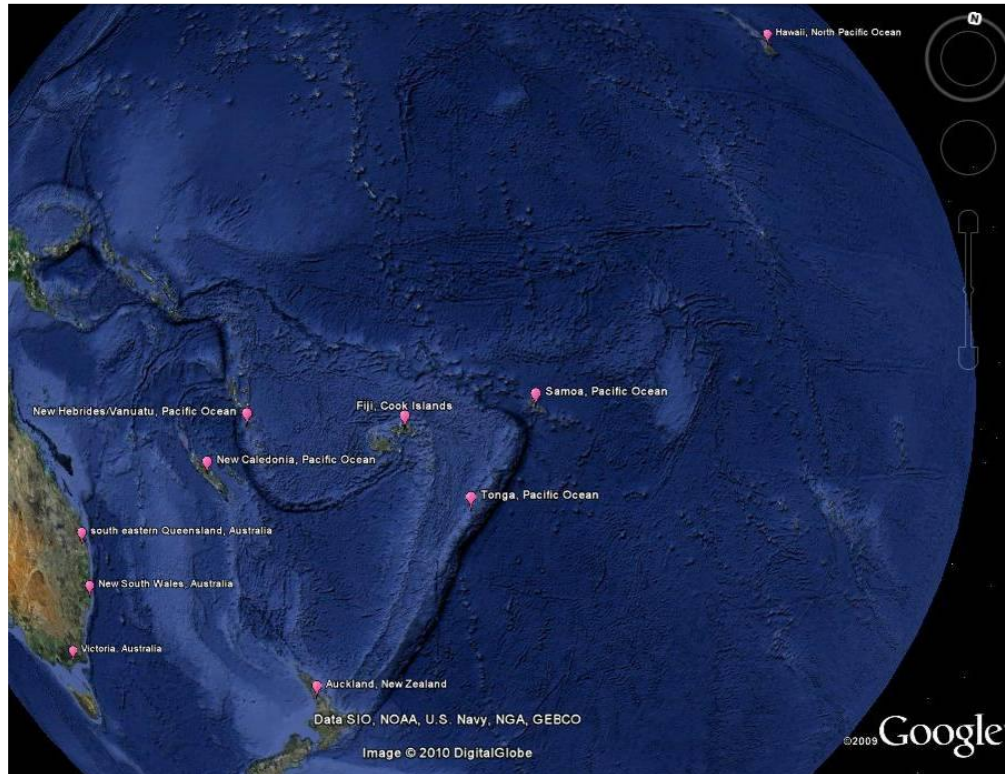
BIOSECURITY SPECIALISTS

Maungaturoto, Rangihua (Great Barrier Island), Waiheke Island, Auckland, Tahora and Stratford. Specimens held in ACG Heath's collection include the following locations; Kaeo, Kaipara, Warkworth, Ponui Island, Morrinsville, Hick's Bay, Hamilton, Otorohanga, Awakino, Taupo, Gisborne, New Plymouth, Patea, Wanganui, Peka Peka, Otaki Beach, Collingwood, Takaka, Motueka, Nelson, Blenheim, Hari Hari. There have been findings, but apparently not established populations, in Pirinoa, east coast North Island, Christchurch city and Southland (Heath 2000; unpublished).



NB. Pink markers represent parthenogenetic populations, yellow - bisexual populations

Haemaphysalis longicornis is believed to have been introduced to Australia on cattle from northern Japan in the nineteenth century and from there it has spread to New Caledonia, New Zealand and Fiji (Hoogstraal *et al.* 1968). The first recorded specimens in New Zealand were taken from a cow at Takahue near Kaitiāia in December 1910 (Myers 1924). Re-introductions of this species have been recorded five times since 1980 (Loth 2005; Heath 2010, unpublished).



Known Hosts: Principal host is domestic cattle on which heavy infestations can occur (Roberts 1970). When brought into contact with horses, deer or sheep, heavy infestations may also occur on these species (Andrews 1964; Hoogstraal *et al.* 1968; Roberts 1970). Other hosts from which specimens have been taken include, human, cat, dog, pig, goat, badger, wildcats, roe deer, spotted deer, bears, foxes, racoons, rabbit (Heath *et al.* 1987) and brown hare (*Lepus europaeus*) as well as the marsupials Eastern Wallaroo (*Macropus robustus*), great grey kangaroo (*Macropus*

major), black striped wallaby (*Wallabia dorsalis*), and northern brown bandicoot (*Isodon macrourus*) (Andrews 1964; Hoogstraal *et al.* 1968; Roberts 1970). Natural infestations of birds, Australian magpie (*Bymnorhina tibicen*) and budgerigar (*Melopsittacus undulatus*) have been observed as well as experimental rearing on the house sparrow (Roberts 1970).

Larvae are primarily found on birds and smaller mammal species including the Asiatic chipmunk (Hoogstraal *et al.* 1968).

In New Zealand, Myers (1924) reported larvae of this tick on children, cattle, horse, hare, cat and birds (thrush, skylark, house sparrow, domestic chicken), nymphs from cattle, horse, hare and dog, and adults on cattle, horse, hare, man, sheep, dog, goat as well as reliable reports of adults on cat, pig, rabbit, domestic duck, turkey, chicken and pheasant. Red deer (Andrews 1964), North Island Brown kiwi, banded rail (Heath *et al.* 1988) and mallard duck (Dumbleton 1953) are also known hosts. Tenquist & Charleston (2001) note this species has also been found on yak (*Bos mutus grunniens*), fallow deer (*Cervus dama*), samba deer, rusa deer, donkey, European hedgehog, ship rat, Norway rat, house mouse, ferret, stoat, weasel and brushtail possum. Additional hosts from specimens lodged in collections include common myna (*Acridotheres tristis*) (Te Papa Tongarewa).

Disease Associations: *Haemaphysalis longicornis* has been shown to be a competent vector of bovine theileriosis (*Theileria orientalis*) in Australia and New Zealand (Hoogstraal *et al.* 1968; Heath 2002) and has also been associated with *Theileria sergenti* and *T. buffeli* (Heath 2002).

Theileria orientalis was first isolated in New Zealand by James *et al.* (1984) who implied but did not demonstrate that *H. longicornis* was the likely vector.

A recent publication by Izzo *et al.* (2010) combines *T. sergenti*, *T. buffeli* and *T. orientalis* as a group and implies that different names are being used in different parts of the world for the same condition caused by the same organism.

There is evidence that this tick is able to transmit the protozoan *Babesia gibsoni* (Heath 1987) and appears to be a competent vector of *Babesia ovata*, *B. major* and possibly *B. bigemina* (Heath 2002) as well as *B. equi* (Ikadni *et al.* 2007). It has also been associated with *Anaplasma phagocytophilum* and *A. bovis* (Mackereth *et al.* 2007) and with Japanese (Oriental) spotted fever *Rickettsia japonica* (Uchida *et al.* 1995; Telford & Goethert 2004).

This species was thought to be an experimental vector of Q fever caused by the rickettsia *Coxiella burnetii* among Australian cattle and humans however this association appears to be erroneous (Heath 2002).

Haemaphysalis longicornis is also capable of transmitting the flavivirus causing Russian spring-summer encephalitis (Hoogstraal *et al.* 1968). An ungrouped Cocksackie-like virus was isolated from this tick in Fiji (Mackereth *et al.* 2007). Powassan encephalitis which is common in the former Soviet Republic and an emerging disease in Canada and northern USA has been isolated from *H. longicornis* (Hoogstraal 1981; Mackereth *et al.* 2007) as has Khasan virus (Mackereth *et*

al. 2007). Molecular evidence for Tick-borne Encephalitis Virus has been found in *H. longicornis* in South Korea (Kim *et al.* 2009).

Additionally haemaphysalid ticks in Japan and China are now suspected to carry *Borrelia* species (Ishiguro *et al.* 2000) which may have implications for *H. longicornis*, although no evidence was found for such an association in Australian populations of *H. longicornis* (Russell *et al.* 1994).

The mass infestations on domestic animals cause concern locally but there have been no verified reports of disease transmission in New Zealand (Myers 1924; Hoogstraal *et al.* 1968). Blood loss from the host can be considerable causing irritation, severe anaemia and occasionally death of calves (Hoogstraal *et al.* 1968) and deer (Neilson & Mossman 1981).

Economic Impact

This species is the only tick of economic importance in New Zealand (Dumbleton 1953) with a reduction in dairy production of up to 25% recorded. Damage to cattle and sheep hides results in lower prices on the market and wool clips are reduced in quantity and quality by sheep rubbing to relieve irritation (Mutch 1966 cited in Hoogstraal *et al.* 1968). Both sheep (Heath *et al.* 1977) and deer (Neilson & Mossman 1981) suffer the combined effects of blood and weight loss from tick infestations.

Taxonomy: Type Locality: Kempsey, New South Wales, Australia. Collected 15 March 1897. Described by Neumann 1901. Part of the Neumann Collection at the National Veterinary School, Toulouse, France and labelled *Haemaphysalis cocinna longicornis* var. Lectotype and paralectotype females designated by GM Kohls (Hoogstraal *et al.* 1968).

Subgenus *Kaiseriana*

Hoogstraal *et al.* (1968) redescribed all stages of this species from strictly parthenogenetic samples from Australia and New Zealand, including a single infertile male specimen. Further work is required to conclusively prove the parthenogenetic and bisexual races are the same species based on the information presented in Hoogstraal *et al.* (1968). However, Oliver *et al.* (1973) suggested, on the basis of cytogenetics, that it was prudent to leave both races under one specific name.

Diagnostic Characters:

Genus – capitulum short with palpi short and conical, article 2 salient basolaterally, scutum inornate, tarsi unarmed, eyes absent (Roberts 1970)

Male – small internal spur on coxa IV, dorsobasal margin of palpal article 3 with strong spur, palpal article 2 with moderate basal salience, dentition 5/5, 4/4 basally, lateral grooves long, linear but well defined and may include first festoon, festoons mainly longer than wide, coxa I with relatively long, pointed internal spur, coxae II-IV with much smaller internal spurs (Roberts 1970), cornua one half length of basis capituli (Hoogstraal *et al.* 1968)

Female – scutum subcircular, at most only slightly longer than wide, palpal article 2 with moderate basal salience, internal spur on coxa I relatively long and pointed, coxae II-IV with much smaller internal spurs, dentition 5/5, marginal grooves long and distinct including first

festoon margin of the scutum is angulated compared to that of *H. bispinosa*, (Roberts 1970), cornua one third length of basis capituli, porose areas oval to subcircular and widely spaced (Hoogstraal *et al.* 1968)

Adults separable from *H. bispinosa* which has 4/4 dentition, is smaller (males 2.0mm, females 2.2mm), few scutal punctations and exceptionally short, widely triangular spurs on coxae II-IV as well as being tropical and bisexual (Hoogstraal *et al.* 1968).

Nymph – palpal article 2 only mildly salient laterally, salience directed anterolaterally, scutum subcircular or regularly rounded, cervical grooves distinct but not reaching scutal margin, dentition 3/3, trochantal spurs present dorsally, coxal spurs as in female (Roberts 1970). *H. longicornis* nymphs are distinguishable from *H. bispinosa* nymphs which have 2/2 dentition, are smaller, short spurs on coxae II-IV, no dorsal projection of the spiracular plates and a small median bulge of the posterodorsal margin of palpal segment 3 (Hoogstraal *et al.* 1968)

Larvae - ventral spur of palpal segment 3 broadly triangular, overlaps anterior ¼ of segment 2, dentition 2/2, cornua reduced to rounded posteroexternal bulges, scutum about 1.6 times as wide as long, coxa I with internal spur broadly triangular, coxae II and III with slight elevated ridge instead of an internal spur, separable by *H. bispinosa* larva in being larger (Hoogstraal *et al.* 1968)

Taxonomic Diagrams: Roberts (1963 – as *bispinosa*); Hoogstraal *et al.* (1968), Roberts (1970),

Biology:

Australian and New Zealand populations exhibit parthenogenetic (triploid) reproduction (Hoogstraal *et al.* 1968; Roberts 1970; Oliver *et al.* 1973) as do those of northern Japan and northeast Russia (Hoogstraal *et al.* 1968). Low number of infertile males are encountered in these populations among many females e.g. 1 to 400 (Roberts 1963; Hoogstraal *et al.* 1968). Southern Japan, Korea and southern former USSR have bisexual (diploid) populations also thought to be *H. longicornis* (Hoogstraal *et al.* 1968; Oliver *et al.* 1973). China appears to contain both types. An aneuploid race also occurs which is capable of both bisexual and parthenogenetic reproduction (Oliver *et al.* 1973).

Larvae, nymphs and females of the parthenogenetic populations were slightly larger than those of the bisexual population in a Japanese study by Kitaoka (cited in Hoogstraal *et al.* 1968). He also found that parthenogenetic females laid fewer eggs and lower temperatures were suitable for development, high temperatures (i.e. 27-30°C) were detrimental to egg development. In contrast, eggs of bisexual populations usually developed at 30-32°C. Females of bisexual populations obviously required fertilisation by males to reproduce. Parthenogenetic females appear to be obligate, with the phenomenon not being governed by external factors or alternating between generations (Hoogstraal *et al.* 1968).

Ticks have been observed feeding on the ears, back of the neck, shoulders and inside flanks of red deer (Andrews 1964 cited in Hoogstraal *et al.* 1968). Typically the groin and axilla (armpits) are common sites for infestation in most hosts, but also the region around the anus in cattle (Heath 1998).

When fully engorged the adult female expands to about 9mm long by 7mm wide (Heath 1998).

Life Cycle – largely ex Heath (1981; 1998)

Female ticks lay their eggs are laid in late spring and early summer and hatch in 60-90 days, depending on temperature and humidity. Larvae climb vegetation and wait for a suitable host. Within an hour of transferring to a host, the larva attaches itself to the skin and remains there for five days. The larva increases markedly in size only during the 24 hours prior to detachment. Fully engorged, the larva detaches from the host, drops to the ground, finds a moist dark place such as a crevice, under a leaf or in the root mat of grass or rushes. There it enters the premoult phase which can last up to 30 days depending on temperature and humidity (Heath 1998).

After moulting into a nymph and being fully “hardened off”, the tick climbs vegetation again in search of a host on which it feeds for seven days, then detaches and shelters for 40 days before moulting into an adult. The adult female then seeks a host, feeding for seven days or longer and searches out a suitable place to lay her eggs after detaching from the host. After 1-2 weeks the female starts laying, producing up to 2000 eggs over a 2-3 week period. She often survives a further two weeks after laying (Heath 1998).

Myers (1924) investigated the longevity of each unfed life stage of *H. longicornis* with the longest survival recorded as follows; larvae – 217 days, nymphs – 263 days and adult females – 249 days. Tsunoda (2008) recorded times somewhat different from these, less in larvae and longer in both nymphs and adult females, but with durations dependent upon relative humidity and the degree of aggregation of each stage, on vegetation.

Seasonality: [New Zealand specimens only] (Myers 1924), Hoogstraal *et al.* (1968), Heath *et al.* (1988) and from specimens held at the NZAC* and in ACG Heath’s collection

Nymphs feed in late winter and early spring, adults predominantly in midsummer and larvae in late summer and autumn. Unfed nymphs overwinter (Myers 1924).

In warm, moist areas with mild winters up to at least two generations can be produced each year, with larvae found in fairly large numbers in early spring as well as in summer and autumn (Heath 1998). Adults and nymphs can be found on host year round apart from mid winter. In contrast, in more temperate areas with more severe winters have only one generation per year and hosts are free of ticks from late autumn to early spring. All stages of the tick may overwinter, but it is more common in nymphs (Heath 1998).

Stage	J	F	M	A	M	J	J	A	S	O	N	D
Females	✓	✓	✓					✓	✓	✓	✓	✓
Nymphs	✓		✓				✓	✓	✓	✓	✓	✓
Larvae	✓	✓	✓	✓	✓	✓		✓	✓		✓	

*Some specimens labelled *Haemaphysalis bispinosa*

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