SURVEY OF RICKETTSIAL VECTORS AND RESERVOIR HOSTS IN MILITARY AREAS OF OPERATION ALONG THAI BORDERS

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ABSTRACT

Background: Besides from well reconized, problematic malaria, rickettsioses, febrile diseases caused by rickettsiae, are often reported in troops deployed to military areas of operation (AOs) along Thai borders. The rickettsiae are intracellular bacteria maintained in nature via mammalian hosts and blood sucking arthropod vectors. Rickettsioses are difficult to diagnosis due to the non-specific symptoms as pyrexia of unknown origin. The diseases can be cured by antibiotic treatment. However, if left untreated, deadly severe complication can occur as a result of destruction of small blood vessel endothelium cell lining in various internal organs caused by bacterial cell invasion. Epidemiological study to gain essential medical intelligence regarding incidence, causative species, and transmission cycle of these diseases is crucial to establish an effective, specific prevention and control strategies to such areas.

Methods: To investigate for rickettsial transmission cycle involving reservoir hosts and vectors, wild rodents were captured and blood suckling arthropods were collected from wild captured rodents, pet animals and human in AOs along Thai borders. Study population was then species identification according to their keys. *Rickettsia-Orientia* Duplex Nested PCR and DNA sequencing were utilized to detect and identify rickettsial agents in specimens. Laboratory data were analyzed with geographical information to generate risk area GIS map.

Results: From November 2010 to May 2012, AOs along Thai-Myanmar, Thai-Laos and Thai-Cambodia Borders were surveyed during both dry and wet seasons. Total 780 clones of blood suckling arthropods were collected. 273 clones of 7 tick species, *Rhipicephalus sp., Haemaphysalis sp., Dermacentor sp., Boophilus sp., Amblyoma sp.* and *Ixodes sp.* collected, DNAs of rickettsiae and *Orientia tsutsgamushi* were detected 28.6% and 07%, respectively.

Only rickettsial DNA was detected in 94% of 456 flea clones comprised of 4 species, *Ctenocephalides canis, Ctenocephalides felis, Echinophaga gallinacean* and *Xenopsylla cheopis.* The other 51 arthropod clones were 5 species of lice, *Heterodoxus spinigerum, Menopon gallinae, Haematopinus asini, Lipeurus caponis, Chelopistes meleagridis* and *Linognathus vituli*. 25.5% of them were infected with rickettsiae. Of total 362 captured rodents, 15 rodent species were identified. Rickettsiae and *O. tsutsgamushi* were detected in 0.6% and 0.8% of rodents, *Bandicota indica, Rattus exulans* and *Rattus surifer*. Identification of rickettsial specific species by DNA sequencing revealed Spotted fever agents, *Rickettsia rickettsii, R. massiliae, R. japonica, R. honei* and *R. marmionii* detected in *Dermacentor, Rhipicephalus* and *Haemaphysalis* ticks, *Echidnophaga gallinacean* Fleas and *Heterodoxus spinigerum* lice collected from humans and dogs, Murine typhus agent*, R. typhi* and Scrub typhus agents*, Orientia tsutsugamushi,st.UT4* and *st.Neimeng65.* Survey data was summary illustrated as risk area map (Figure 1), which generated from laboratory results in combination with geographical information using GIS technology.

Conclusion: We clearly demonstrated these border AOs are endemic foci for flea-borne, tick-borne and mite-borne rickettsioses and also how the diseases were transmitted to human. This medical intelligence information is crucial to establish an effective disease prevention and control strategy specific to such AOs.Prior to deploy, military personnel should be well educated to recognize infectious diseases endemic in each area and practice how to prevent themselves from infection. Medical supplies must be provided according to degree of risk as indicated on map. Furthermore, the availability of local isolates may lead to the development of more sensitive and specific diagnostic tools. m laboratory results in combination with geographical information using GIS technology.

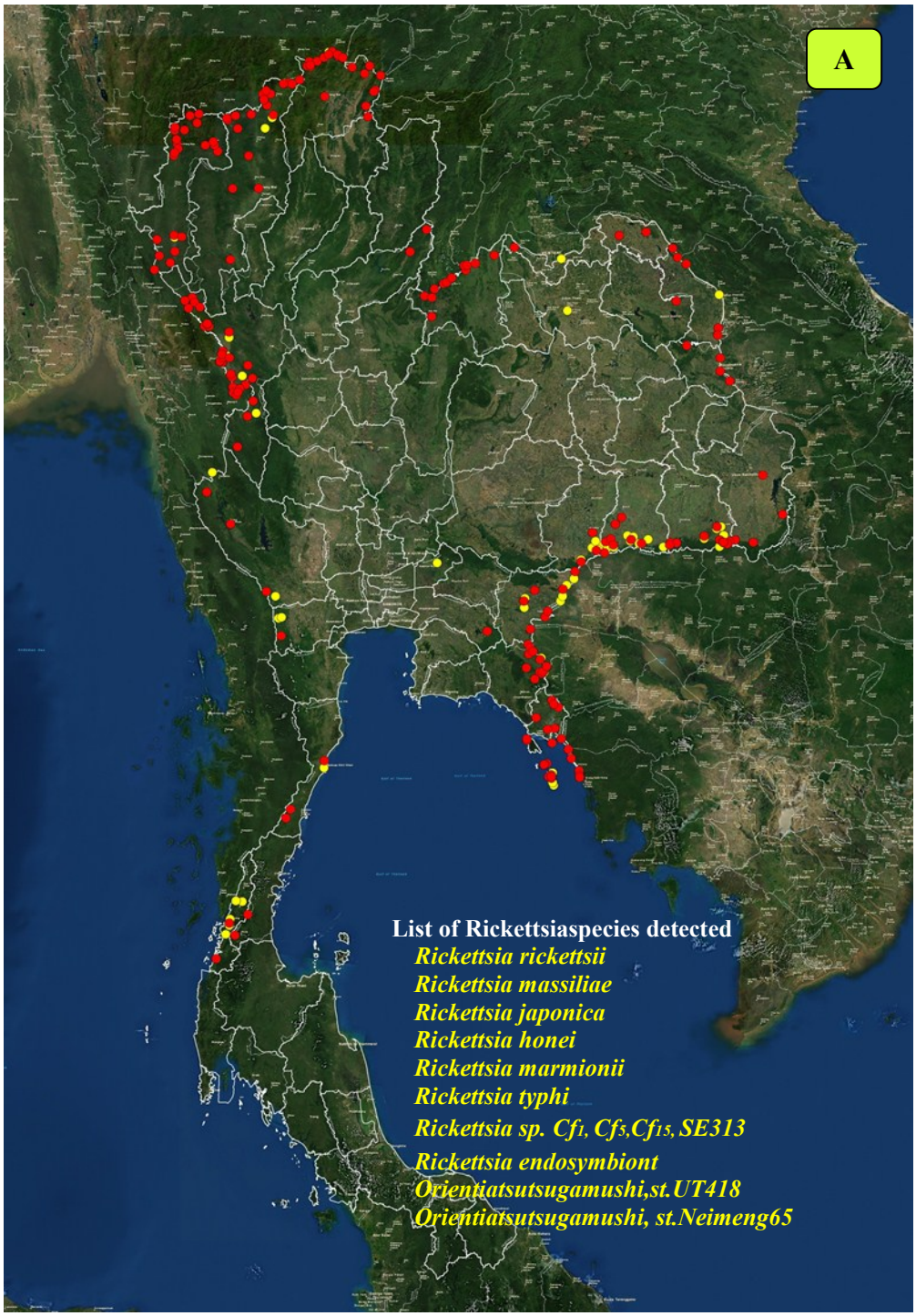

Figure 1.A. GIS mapping of surveyareaswhere blood sucking arthropods and rodents were collected (yellow dot) and rickettsial DNA detected (red dot) **B.** Tick survey **C.** Flea survey **D.** Louse survey **E.** Rodent survey.

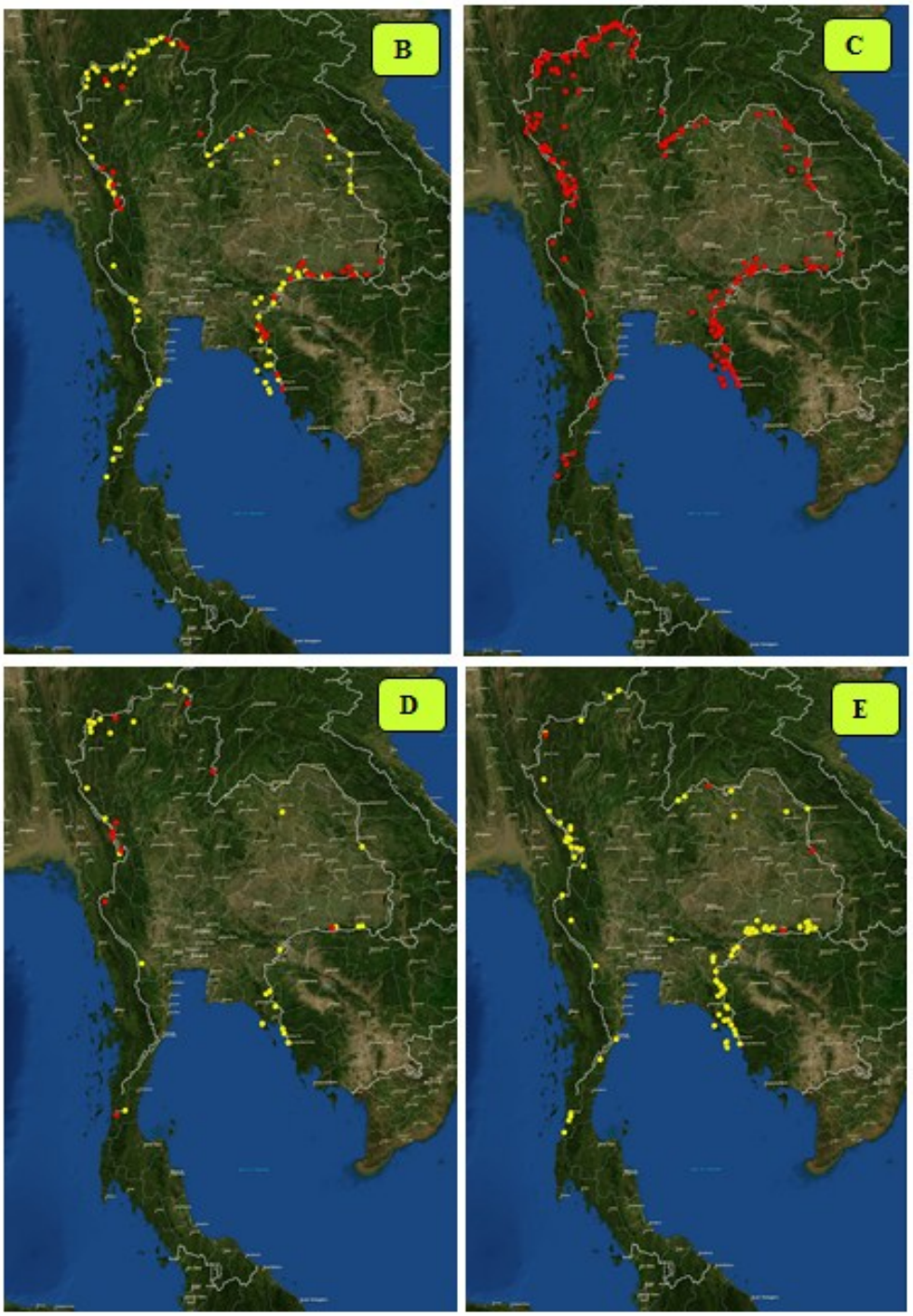

Figure 1. (Cont.) **A.** GIS mapping of survey areas where blood sucking arthropods and rodents were collected (yellow dot) and rickettsial DNA detected (red dot) **B.** Tick survey **C.** Flea survey **D.** Louse survey **E.** Rodent survey.