

Cattle Fever Ticks & Nilgai

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Texas A&M Kingsville- Cesar Kleberg Wildlife Institute, Kingsville, TX
East Foundation, San Antonio, TX
USDA-ARS, College Station, TX & Byron, GA



Agricultural
Research
Service



Farm Bill Proposal

Texas Farm Bureau

Research Objectives:

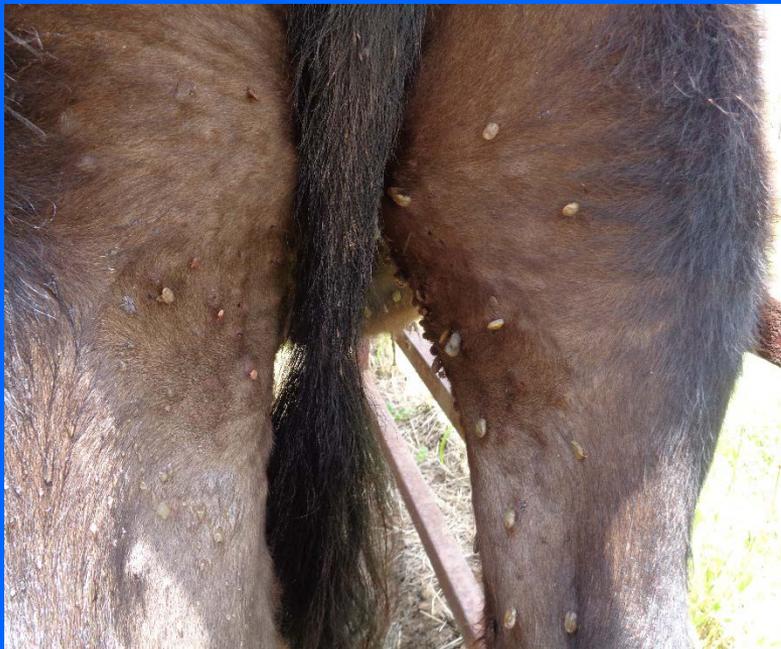
- 1: Improve diagnostic detection of tick-infested/infected animals and pastures (TAMU, ARS)
- 2: Develop alternative treatment methods for cattle (TAMU, ARS, TAMU-K)
- 3: Field treatments for horses, corrals, pens, and pasture loafing areas (TAMU, ARS)
- 4: Develop methods for control of cattle fever ticks on nilgai antelope (ARS, TAMU-K)
5. Improve effectiveness of treatments for cattle fever tick infested deer (TAMUK, ARS)
- 6: Identify, evaluate and release biological control agents from native range of cattle fever ticks in Southeast Asia and Europe. (ARS).
- 7: Discovery and testing of new vaccines for control of cattle fever ticks and Babesia pathogen (TAMU-VS, ARS)
- 8: Evaluation of rangeland vegetation that effects survival of cattle fever ticks (TAMU, ARS)
- 9: Development of artificial rearing systems for ticks to accelerate testing of vaccines, acaricides and biological control agents. (TAMU, ARS)
10. Outreach to South Texas ranchers, hunters and landowners to integrate eradication tactics and document sustainability of best practices (Extension, TAMU, TAMUK, ARS)

Cattle Fever Tick (CFT)

Rhipicephalus (=Boophilus) microplus



- One host tick
- Hosts: Bovidae & Cervidae
- Transmit bovine babesiosis
- Resistant to most acaricides
- Worldwide distribution in tropical, subtropical and warm temperate climates
- Major limitation to cattle & milk production



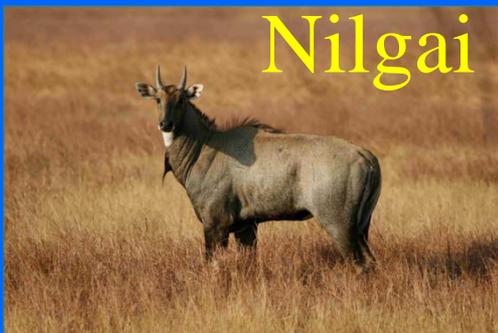
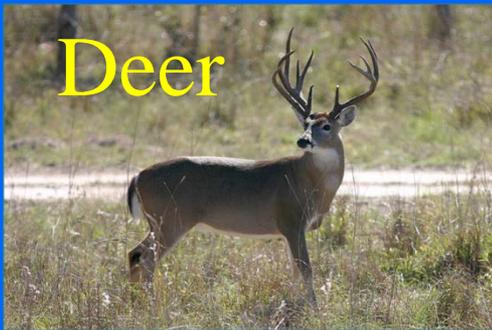
Hosts of Cattle Fever Ticks



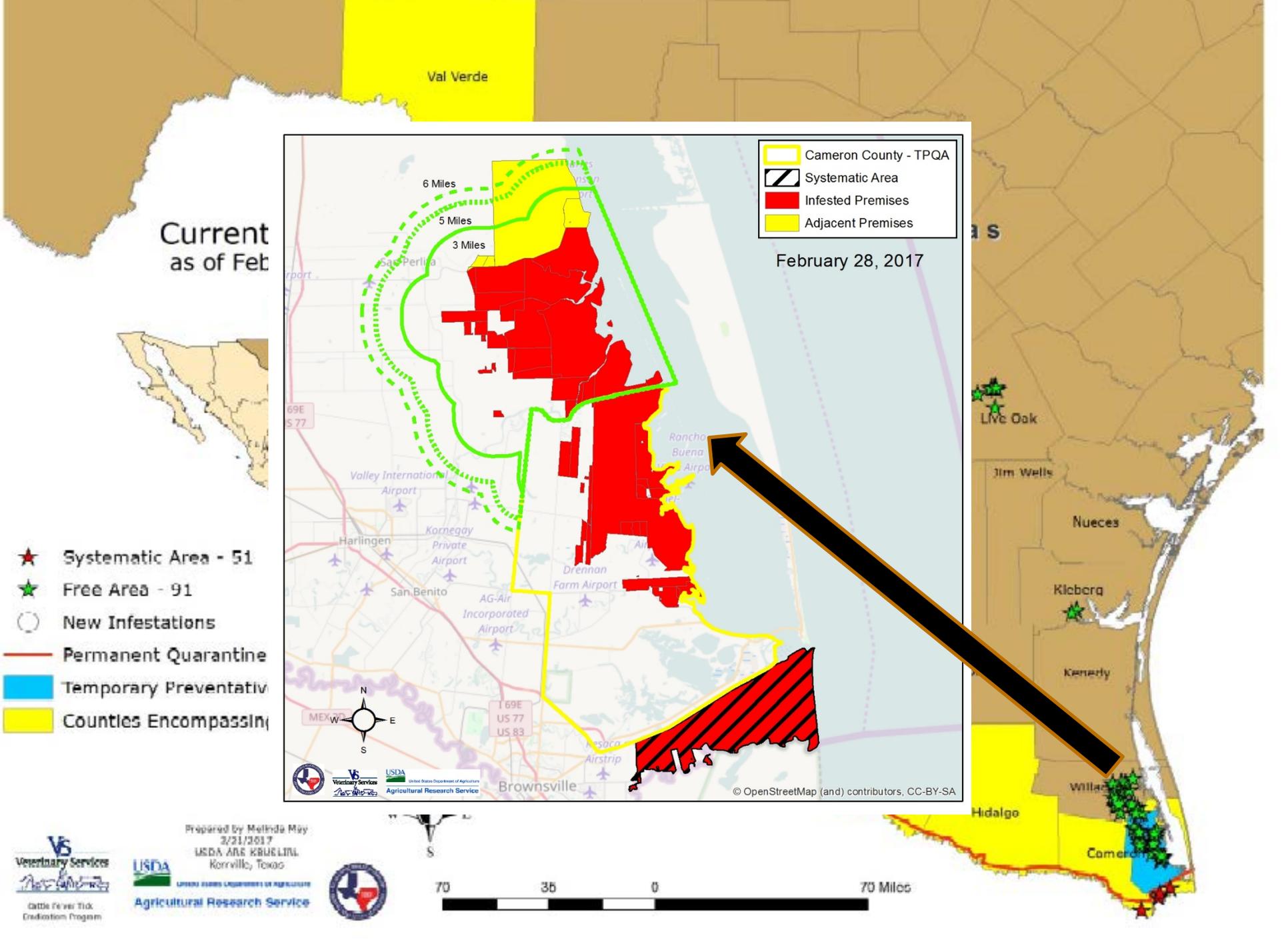
Not Hosts



Cattle Fever Tick Hosts Texas & Mexico



- Acaricides, vaccines
- Medicated corn feeders
- No known methods for treatment

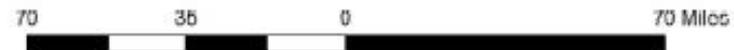
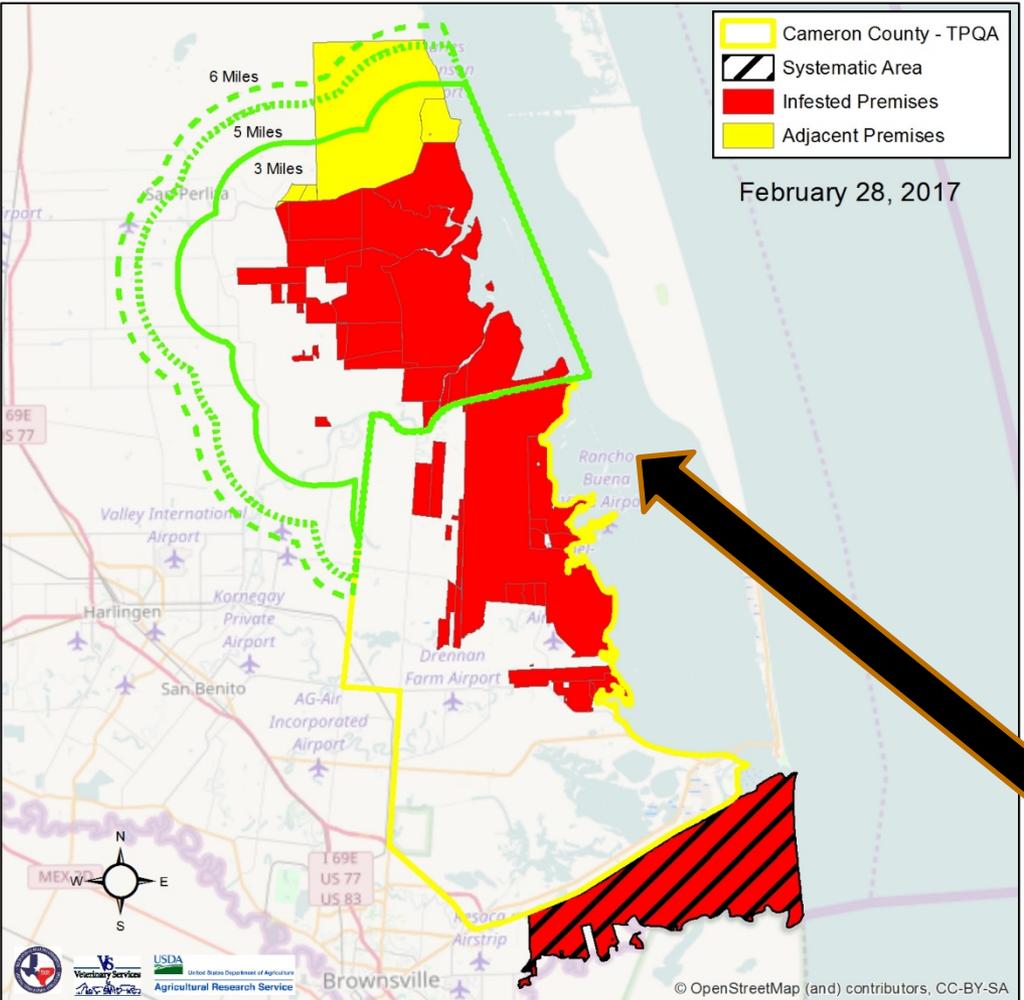


Current as of Feb 28, 2017

- Cameron County - TPQA
- Systematic Area
- Infested Premises
- Adjacent Premises

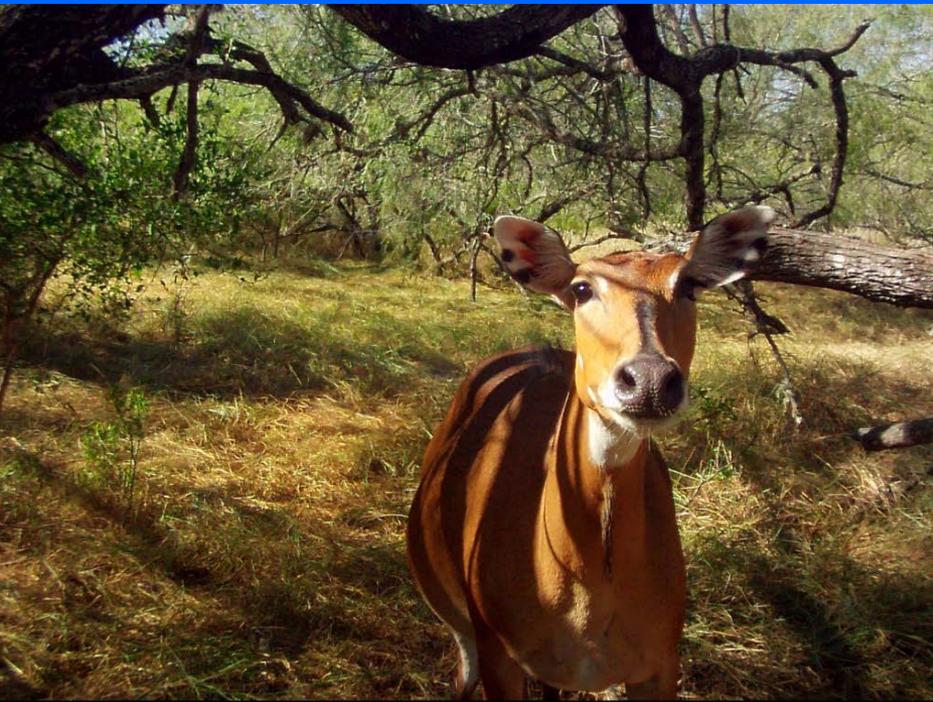
February 28, 2017

- ★ Systematic Area - 51
- ★ Free Area - 91
- New Infestations
- Permanent Quarantine
- Temporary Preventative
- Counties Encompassing



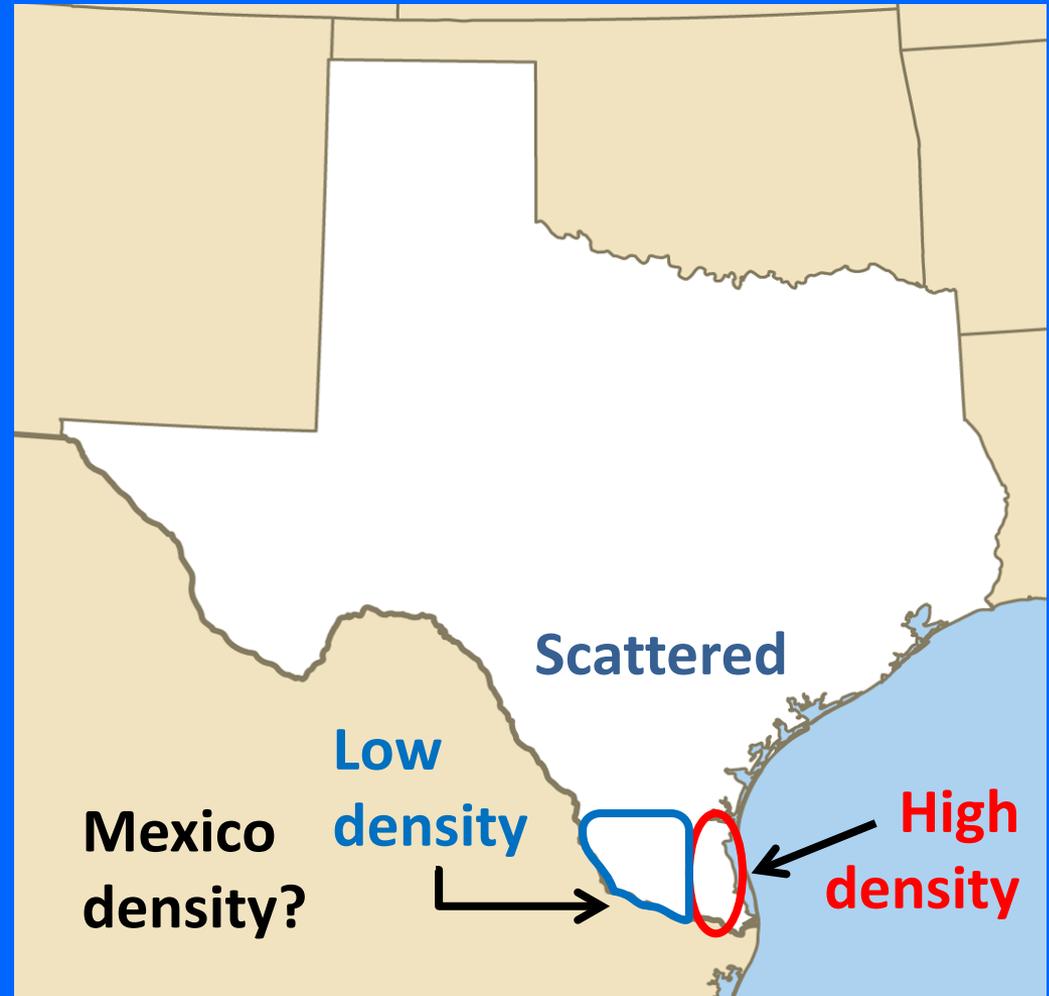
Nilgai Biology

- Members of the Bovidae
- Closely related to cattle
- Native to India
- Cows – 600 lbs. Bulls – 800 lbs.



Nilgai Distribution

- Free-ranging in South Texas and NE Mexico
- 30,000 – 40,000 in Texas



Nilgai Research Questions

What is their home range?

Can we lure nilgai to a treatment?

Can latrines be used as treatment locations?

How can nilgai be treated in remote pastures?

What can be used to treat nilgai in environmentally sensitive areas like wildlife refuges?

Nilgai Home Range Study

- Collaborators: Hewitt, Foley, TAMUK; Campbell and Ortega – East Foundation
- Funding: Texas Animal Health Commission
- Location: East Foundation – El Sauz, Willacy Co.
- 30 adult nilgai collared with GPS tracking devices
- 50:50 bulls/cows
- Data: home range, max distance, effect of helicopters, physical barriers (roads & farmland)
- A. M. Foley, J. A. Goolsby, A. Ortega-S. Jr., J. A. Ortega-S, A. Pérez de León, N. K. Singh, A. Schwartz, D. Ellis, H. Hasel, D. G. Hewitt, T. A. Campbell . 2017. Movement Patterns of Nilgai Antelope (*Boselaphus tragocamelus*) in South Texas: Implications for Cattle Fever Tick Management. Preventive Veterinary Medicine 146: 166–172.



30 miles

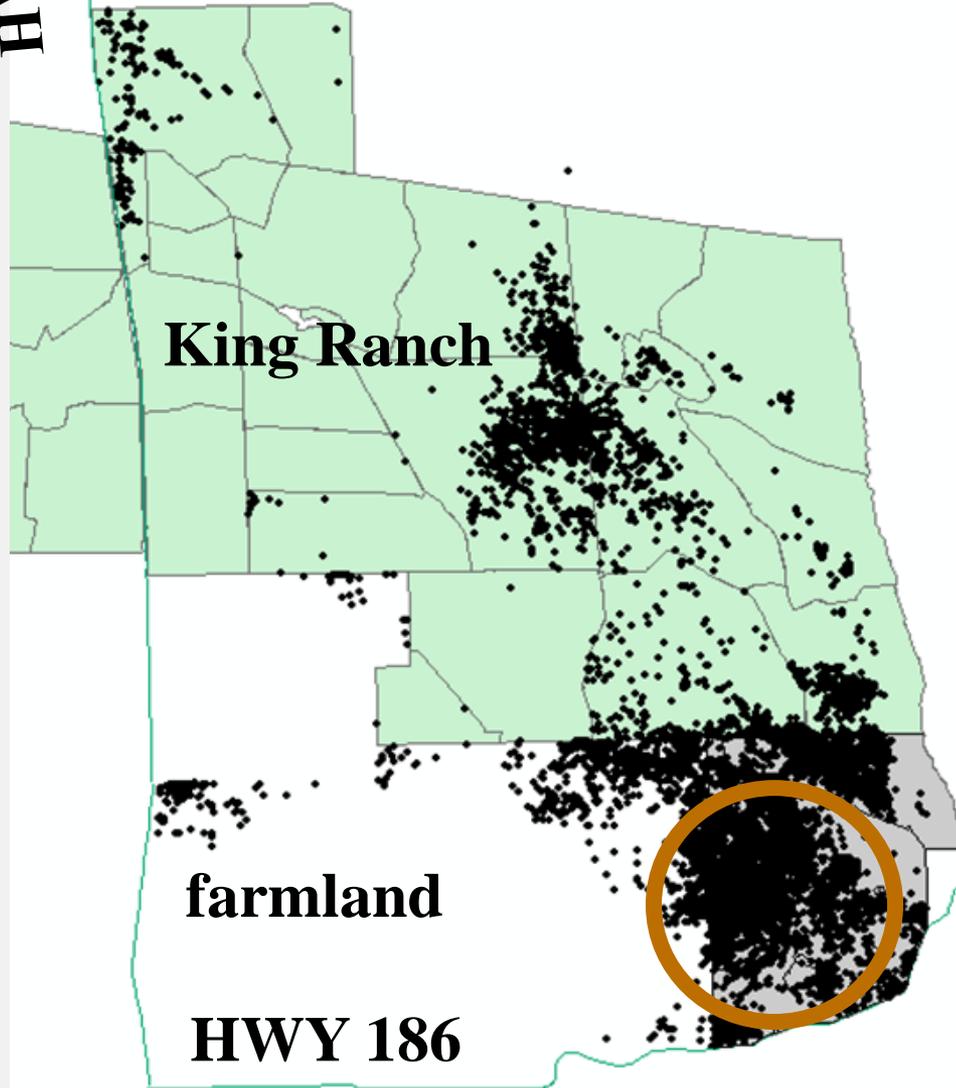
Laguna Madre

Red Fish Bay

Port Mansfield

30 Nilgai – 1 year

HWY 77



King Ranch

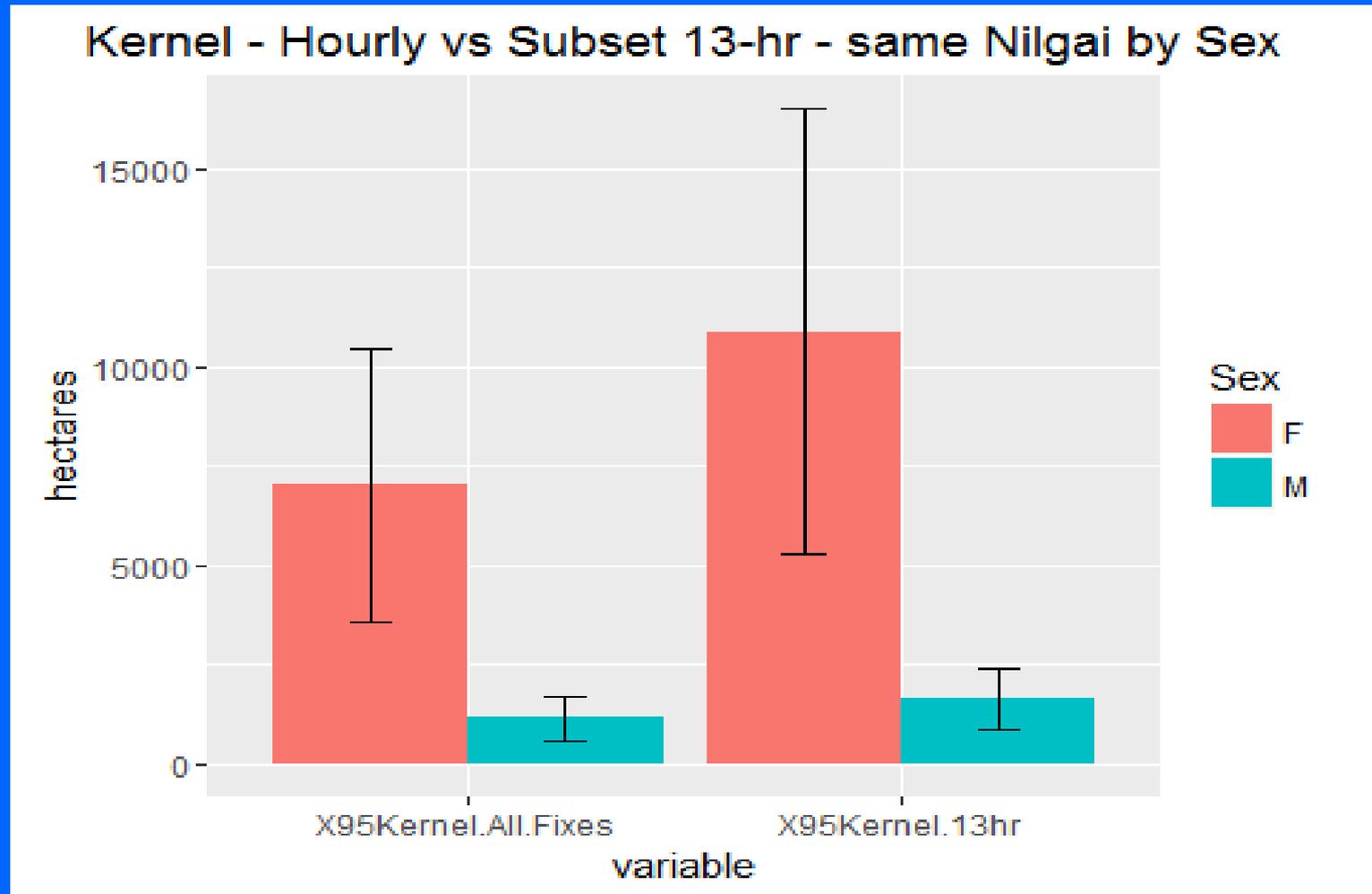
El Sauz

farmland

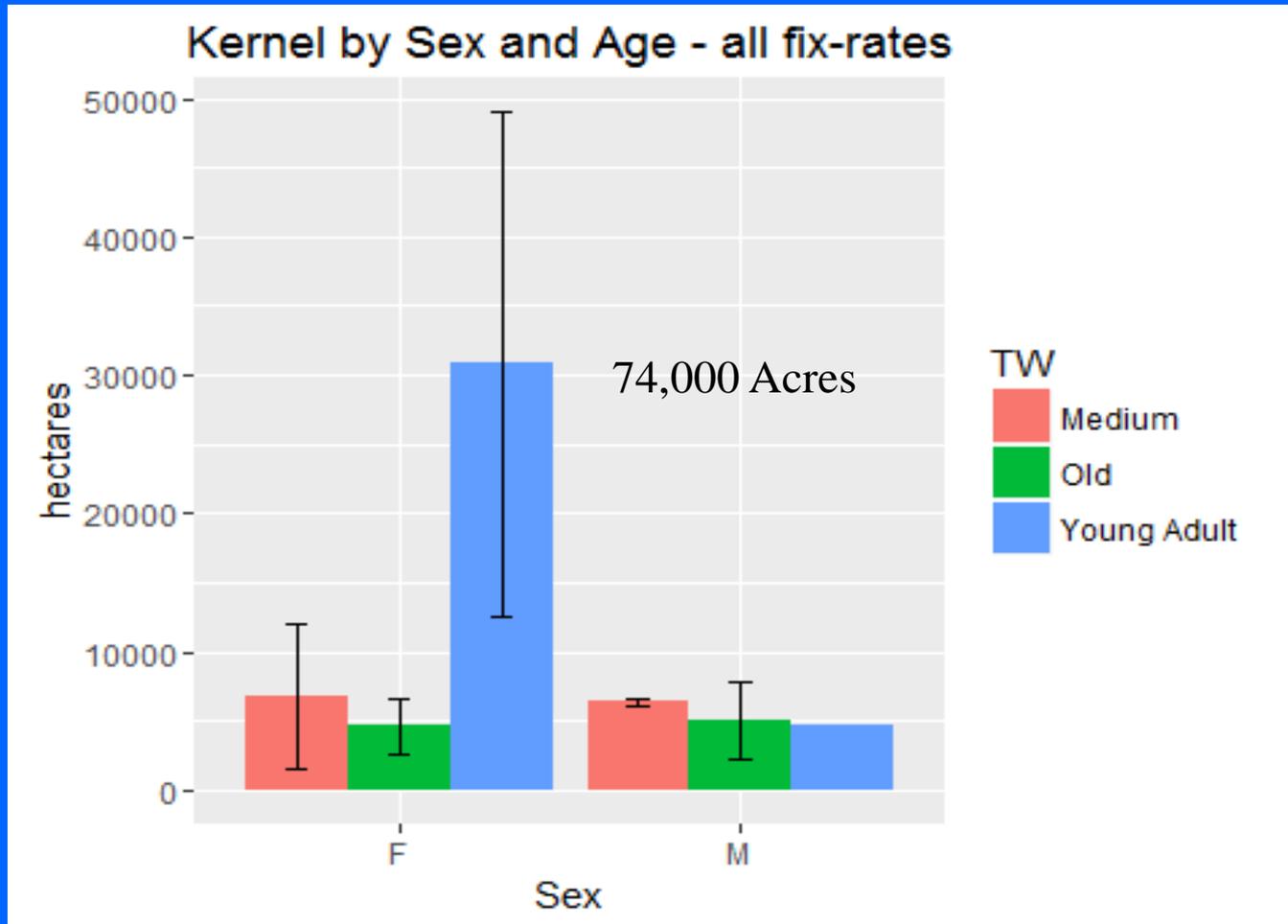
Port Mansfield

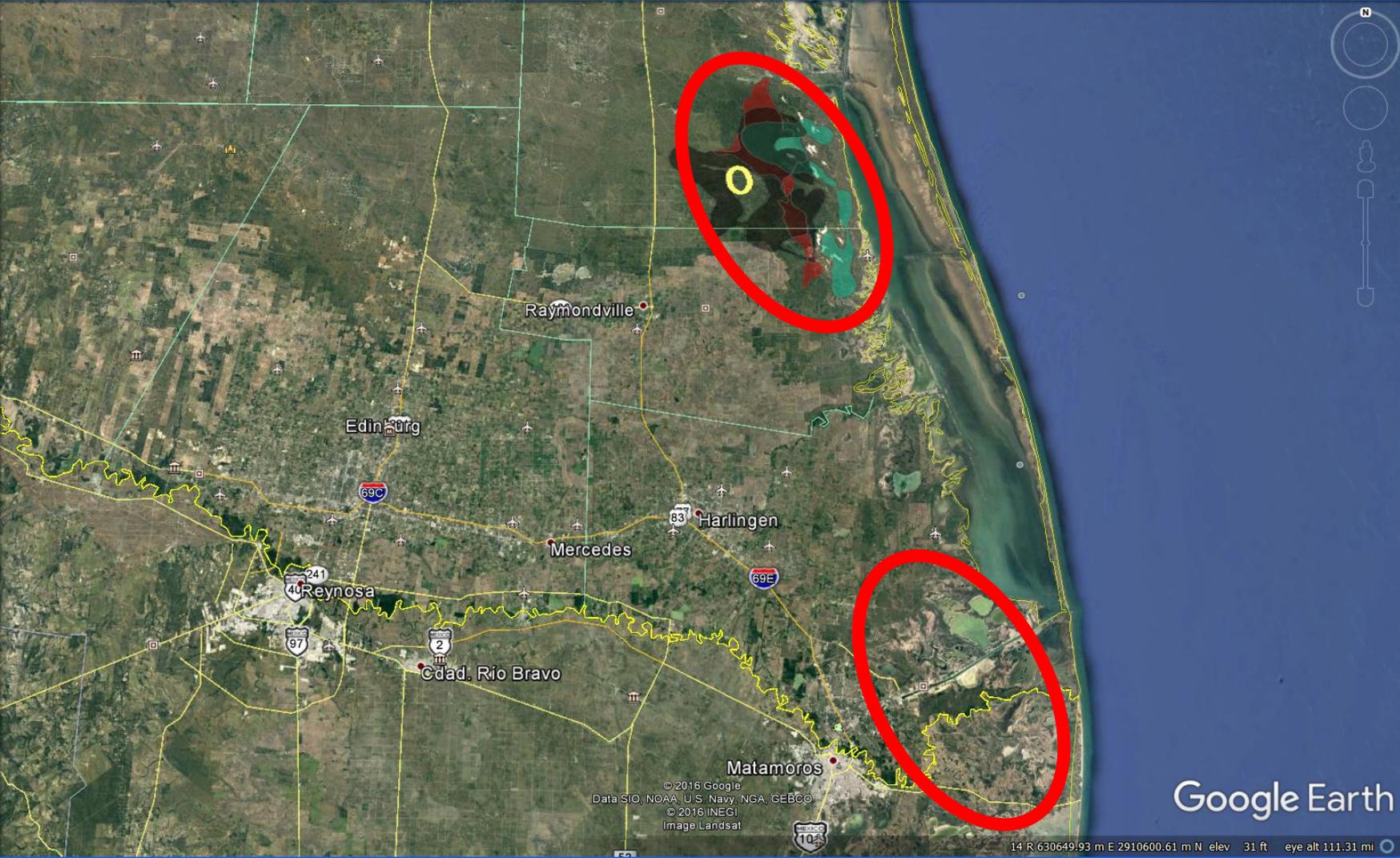
HWY 186

Females have > home range



Young females have largest home range by far!





Raymondville

Edinburg

Mercedes

Harlingen

Reynosa

Cdad. Río Bravo

Matamoros

Google Earth

14 R 630649.93 m E 2910600.61 m N elev 31 ft eye alt 111.31 mi

© 2016 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2016 INEGI
Image Landsat



NILGAI MOVEMENTS ON EL SAUZ

On one hand, nilgai antelope are a prized trophy for hunters, offering year-round recreational opportunities. On the other hand, nilgai compete for forage with cattle and white-tailed deer, and are a host of cattle fever ticks, thus complicating tick eradication strategies. As such, nilgai are loved by some landowners and loathed by other landowners. Either way, more information is needed to develop effective nilgai management strategies.

Very little is known about the biology of nilgai on rangelands of South Texas, particularly related to their movement rates, patterns, and habits. In a recent publication investigating nilgai movements in South Texas, animals displayed no differences between sexes in home range size and had maximum home range axes between 8 and 10 miles. However, nilgai behavior was highly variable. New GPS collars allow for more detailed characterizations of animal movements.



Together with our partners, we placed 30 state-of-the-art GPS collars on 15 cow nilgai and 15 bull nilgai in early April 2015 on our El Sauz Ranch. GPS locations from only a few months of sampling on the El Sauz Ranch suggest:

- About half of nilgai remained on the Ranch
- About a quarter of nilgai used the Ranch and adjacent properties
- About a quarter of nilgai moved away from the Ranch
- For animals that have moved away from the Ranch, distances were from 1 to 30 miles



Our ultimate goal is to gain understanding of nilgai behavior and determine effective management unit size. This will enable landowners to make informed management decisions related to this non-native animal.

Partners: Texas Animal Health Commission, United States Department of Agriculture, and Caesar Kleberg Wildlife Research Institute.

Nilgai make common latrines



Tigers major predator in India

Nilgai Lure Study

- Nilgai attractants would be useful for developing CFT treatments
- Nilgai form communal latrines
- Nilgai prefer to make latrines on offal
- Tested synthetic offal (Screw worm lure, and bovine volatile fatty acids (VFA))
- Mahua flowers – known lure in India

Nilgai Latrine

Offal – Induces Latrine



Screwworm Lure – Offal Mimic



Nilgai Bull at Lure



Nilgai Lure Study Results

- Offal the most attractive
- Screwworm lure the only other lure that induced latrine formation
- Latrines – treat nilgai for ticks

Goolsby, J.A., Singh, N. K., Ortega-S. A., Jr., Hewitt, D.G., Campbell, T.A, Wester, D. and Pérez de León, A.A.. (2017) Comparison of natural and artificial odor lures for nilgai (*Boselaphus tragocamelus*) and white-tailed deer (*Odocoileus virginianus*) in South Texas: developing treatment for cattle fever tick eradication. *International Journal for Parasitology: Parasites and Wildlife*. 6:100-107



Latrine Ecology



- Funded by Las Huellas wildlife organization
- Study with CKWRI, De Young & Zoromski
- How many latrines per acre
- How many nilgai visit each latrine (molecular analysis of dung)
- Tie-in to nilgai sprayer

Attract and Treat at Latrines

- Use remote operated sprayer to treat nilgai
- Use nematode, native *Steinernema riobravae* to control CFT, acceptable for USFWS.
- Nematode native to Hidalgo and Cameron Counties

Nilgai Sprayer



Nilgai at Latrine

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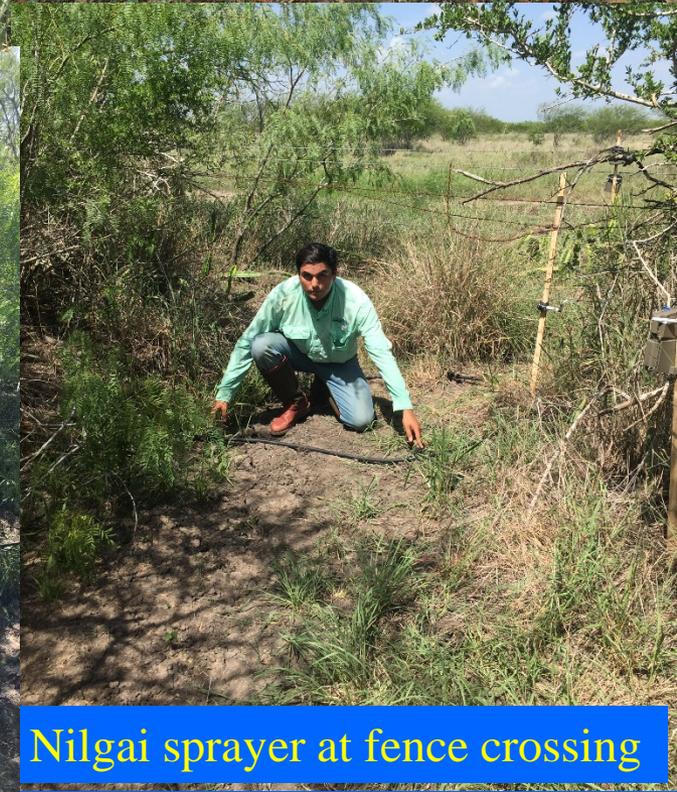
Nilgai sprayer at latrine



Nematode spray tank & pump



Mist from sprayer



Nilgai sprayer at fence crossing

Nilgai Sprayer



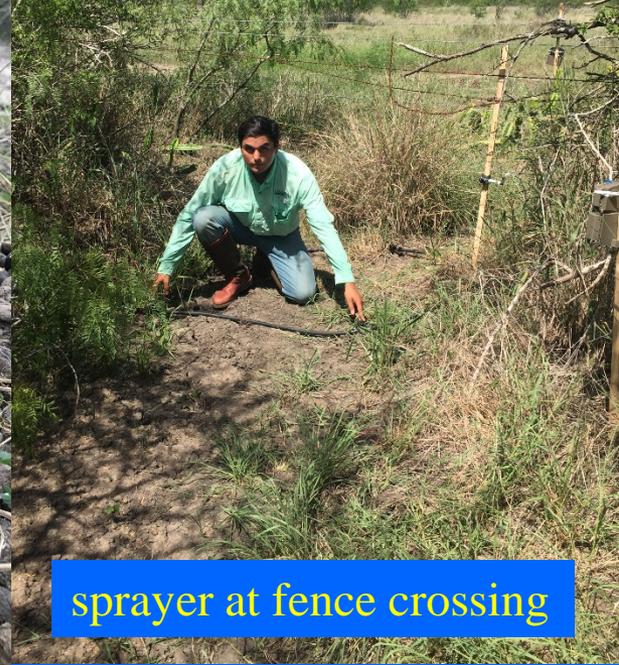
Nilgai at Latrine

MOULTRE CAMERA 1 05 OCT 201

Nilgai sprayer at latrine



Nilgai sprayer Cameron Co.



sprayer at fence crossing



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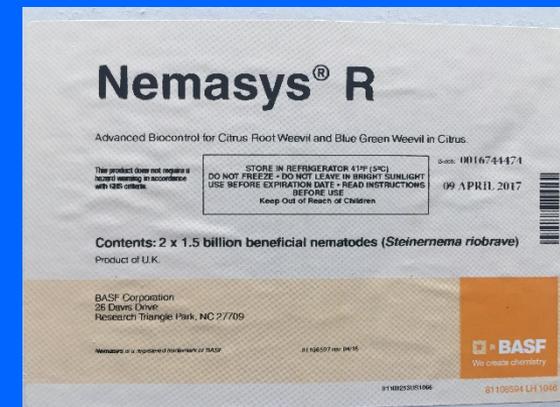
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Nilgai sprayer at water trough



Lab and barn test of tick nematodes

- *Heterorhabdita floridensis* & *Steinernema riobravae* highly effective in lab assays
- Whole animal treatment study at 1X completed with moderate efficacy. Plan to repeat at 10X
- *Steinernema riobravae* native to South Texas and Northeastern Mexico and has high heat tolerance
- *S. riobravae* is commercially available from BASF Company



Nematode Infection of CFT

7 days after nematode application



control



1 day after nematode application



Normal cattle fever tick

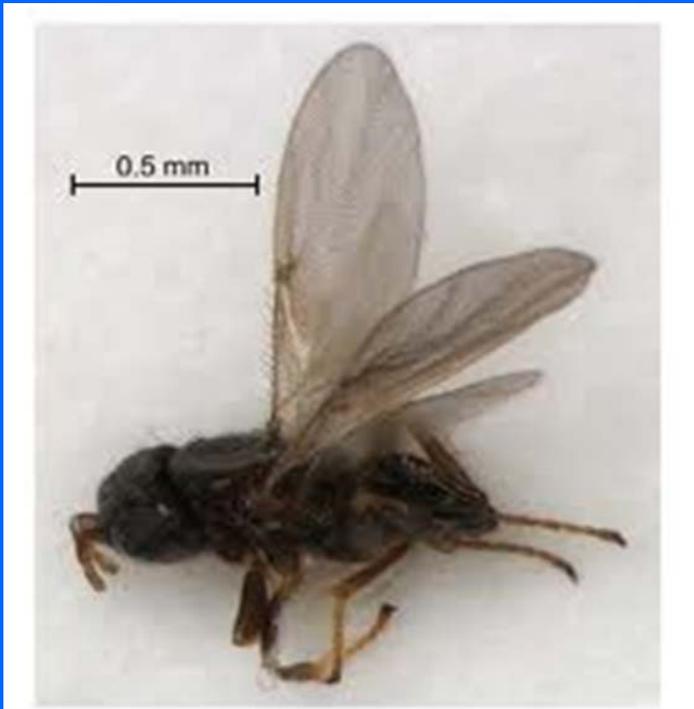


Eradication of CFT on Nilgai

- Attract and treat nilgai at latrines, fence crossings and water troughs
- Use commercial nematode
- Nilgai sprayer in advanced stage of development
- Deploy system on refuge and hot spots

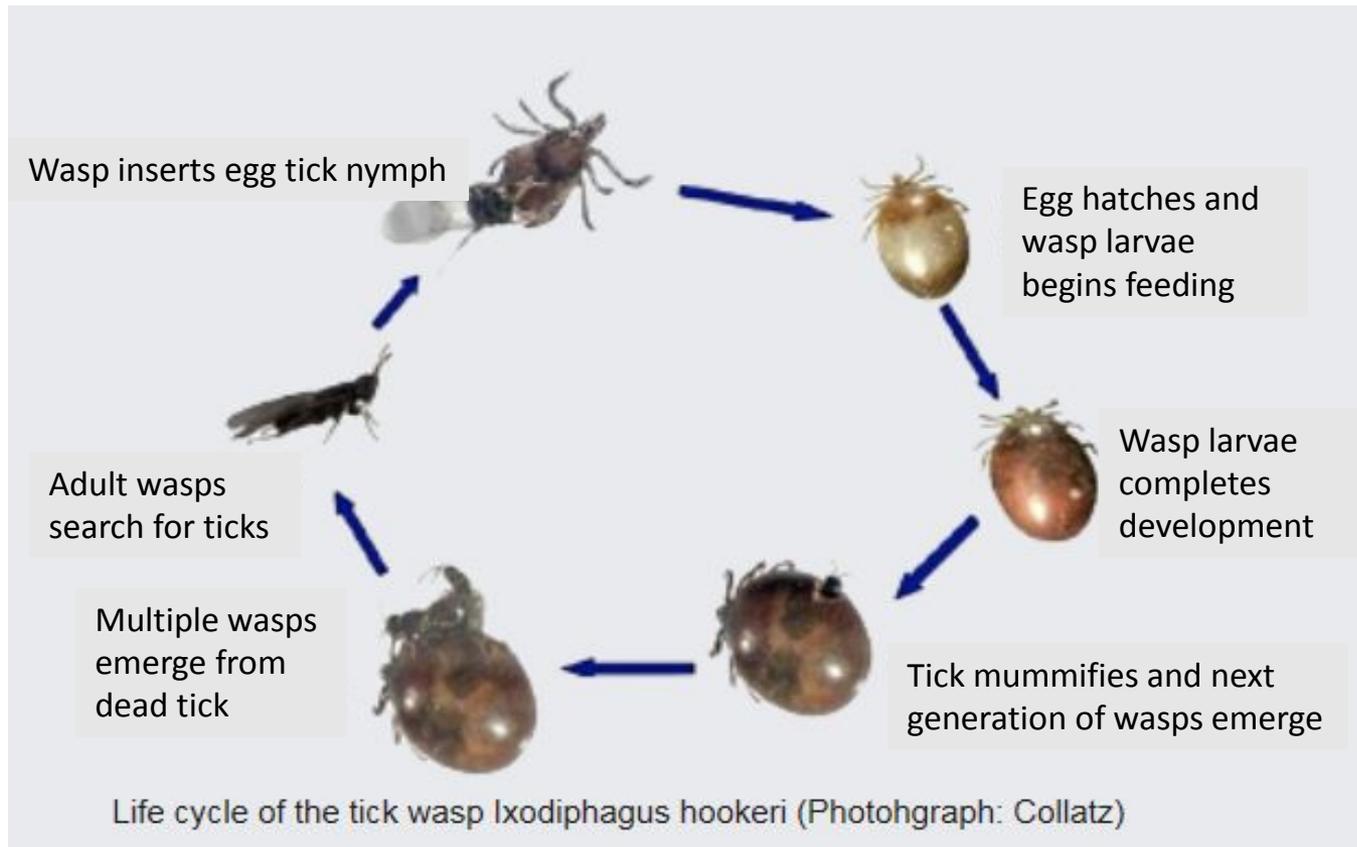
Biological Control of Cattle Fever Ticks

Tick Parasitoids



- Native N. American ticks attacked by parasitic wasps
- Don't attack exotic TX ticks
- Find specialist tick parasitoids in native range of cattle fever tick.
- Control tick off animal.
- Complements eradication efforts

Life cycle of the tick parasitoid *Ixodiphagus hookeri* on *Ixodes ricinus* tick in Asia



Distributions of cattle fever ticks

J. Goolsby¹, F. Guerrero², J. Kashefi³, L. Smith³, A. Racelis⁴, D. Amalin⁵, M.J. Flores⁵, N. Abes⁵, K. Verly⁵, N. Singh⁶, P. Azhahianambi⁷, A. Jesudasan⁸, P. DeBarro⁹, A. Sheppard⁹, K. Wycykuys¹⁰, J. Liu¹¹, A. Schwartz¹², H. Hasel¹³, K. Varner¹³, & A. Pérez de León²
¹United States Dept. of Agriculture, Agricultural Research Service, Knippling Bushland U.S. Livestock Insect Pest Research Laboratory, Cattle Fever Tick Unit, Edinburg, TX, john.goolsby@ars.usda.gov; ²USDA-ARS Knippling Bushland U.S. Livestock Insect Pest Research Laboratory, Veterinary Pest Genomics Center, Kerrville, TX; ³USDA-ARS European Biological Control Laboratory, Montpellier, France; ⁴Univ. of Texas, Rio Grande Valley; ⁵De La Salle University, Manila, Philippines; ⁶Dept. of Veterinary Parasitology, Guru Angad, Dev Veterinary and Animal Sciences Univ., Punjab, India; ⁷Dept. of Veterinary Parasitology, Madras Veterinary College, TANUVAS, Chennai, India; ⁸Madras Christian College, Chennai, India; ⁹CSIRO Health & Biosecurity, Brisbane & Canberra, Australia; ¹⁰International Center for Tropical Agriculture, Hanoi, Vietnam; ¹¹Hebei Normal University, Shijiazhuang, Hebei, P.R. China; ¹²Texas Animal Health Commission, Austin, TX; ¹³USDA-APHIS, Cattle Fever Tick Eradication Program, Laredo, TX.

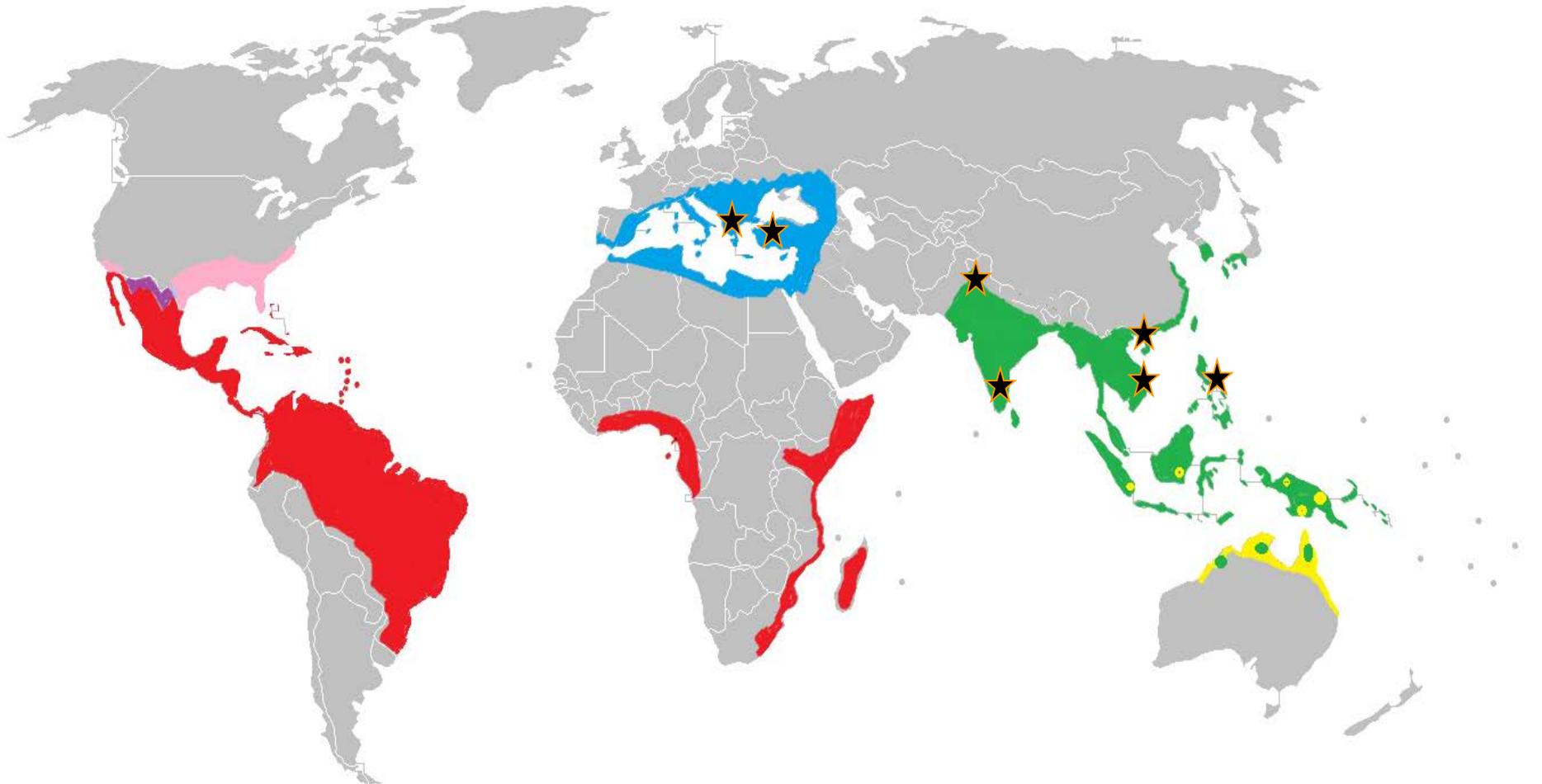


Fig. 1. Native and introduced ranges of cattle fever ticks (*Rhipicephalus* spp.) **Red** = introduced range of *R. microplus*, **Pink** = *R. microplus* eradicated, **Blue** = native range of *R. annulatus*, **Purple** = introduced range, **Green** = native range of *R. microplus*, **Yellow** = native range of *R. australensis*. Stars = search locations for biocontrol agents.

India



The Philippines



Vietnam



Greece and Bulgaria

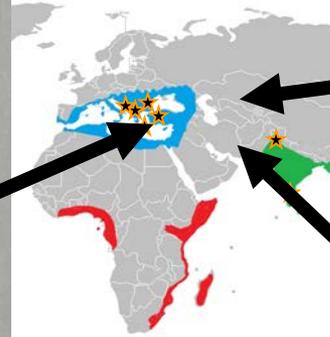


Biological control of cattle fever ticks

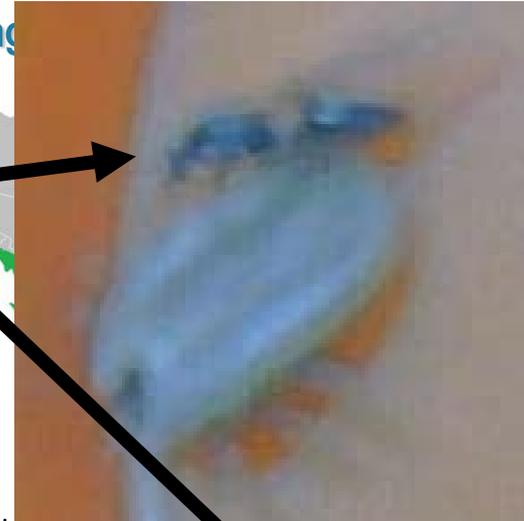
P. Azhahianambi⁷, A. Jesudasan⁸, P. DeBarro⁹, A. Sheppard⁹, K. Wycykuys¹⁰, J. Liu¹¹, A. Schwartz¹², H. Hasel¹³, K. Varner¹³, & A. Pérez de León²
 g. TX, john.goolsby@ars.usda.gov; ²USDA-ARS Knippling Bushland U.S. Livestock Insect Pest Research Laboratory, Veterinary Pest Genomics Center, Kerrville, TX; ³USDA-ARS European Biological Control
 Veterinary and Animal Sciences Univ., Punjab, India; ⁴Dept. of Veterinary Parasitology, Madras Veterinary College, TANUVAS, Chennai, India; ⁵Madras Christian College, Chennai, India; ⁶CSIRO Health &
 na; ⁷Texas Animal Health Commission, Austin, TX; ⁸USDA-APHIS, Cattle Fever Tick Eradication Program, Laredo, TX.



on in Native Range



l ranges of cattle fever ticks (*Rhipicephalus* spp.) **Red** = *R. microplus*, **Pink** = *R. microplus* eradicated, **Blue** = native range of *R. microplus*, **Green** = native range of *R. microplus*, **Yellow** = introduced range, **Green** = native range of *R. microplus*,



ol Agents



ooker, a parasitoid of the specialist parasitoid occurs in *agous aethes*, a newly



onics and *Walshia australis* which are known to parasitize *R. microplus* in their native Australia. On right is a steinernematid nematode which can be used as a tick biocontrol. Other CFT specialists may occur in the native range.

TICK EXPOSURE



Fig. 2 (A) Vial of 500 questing larvae to be glued to the heifers for release of the questing tick larvae to the heifers, (C) The heifers being run through the vial of questing tick larvae to be released on them, (D) Glue is placed on the vial placed on the top of the heifer's shoulder, (E) Questing tick larvae to be glued to the heifer's shoulder, (F) The heifers in the pen after they were manually infested with *R. microplus* questing larvae



ORS



Summary

- Cattle fever ticks expanding their range in South Texas.
- Nilgai implicated in long range spread of ticks
- Treatment methods for nilgai in development
- Exploration for biocontrol agents of cattle fever tick underway in Asia
- New tools needed from researchers to keep cattle fever tick eradicated