

Alternative management strategies for outdoor nuisance cockroaches in California



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University of California
Agriculture and Natural Resources

Statewide Integrated Pest
Management Program





Urban Integrated Pest Management



Who We Are

Research Activities

Residential IPM

Structural / Industrial IPM

Commercial Landscape
IPM

Selected Publications

Urban IPM

We work with professionals to improve pest control through research and education in order to protect our communities and the environment.



This website provides information about urban integrated pest management (iPM) and highlights the activities of UC ANR's urban iPM program in the San Francisco Bay Area.

<https://ucanr.edu/sites/urbanIPM/>

COMMON COCKROACHES OF CALIFORNIA

Brown Banded Cockroach
Supella longipalpis

0.5 inch, golden tan to medium brown bodies, males and females both have light-colored bands on abdomen, wings[♂] and sides of pronotum[♂]

Preferred location: warm areas indoors, electrical appliances, water heater and boiler rooms.

German Cockroach
Blattella germanica

0.5 inch, caramel-colored, with two longitudinal dark stripes[♂] along the top of the body. Face lacks distinct dark stripe, unlike field cockroach[♂]

Preferred location: kitchens, bathrooms, food preparation and storage areas.

Three-lined Cockroach
Supella marmorata

0.25 inch, very small with three black stripes along the pronotum and abdomen[♂]

Preferred location: leaf litter, compost piles, and plant debris.

Turkistan Cockroach
Blattella tatarica

1 inch, cream-colored markings along edges of wings[♂]. Additionally, males can have cream-colored markings around the edges of the pronotum[♂]

Preferred location: water meter boxes, cracks and joints in concrete, filter and potted plants.

Oriental Cockroach
Blattella orientalis

1.25 inches; uniformly black to dark brown. Wings may appear absent and are always shorter than body[♂]

Preferred location: garages, basements, leaf litter, ground cover, water meter boxes and in drains.

Field Cockroach
Blattella vaga

0.5 inch, gray to olive brown, with two black stripes on pronotum[♂]. Face contains one black stripe between the eyes[♂]

Preferred location: leaf litter, plant debris and wood piles.

American Cockroach
Periplaneta americana

2 inches, reddish brown body, edges of pronotum are light-colored[♂]. Upper margins of forewing lack tan-colored bands unlike the similar looking Australian cockroach[♂]. Most common in industrial and urban settings with fatty plumbing.

Preferred location: sewers, storm drains and clean tunnels.

University of California
Division of Insect Sciences
Created by: Casey Hebble
& Andrew Sutherland
Photography by: David Glavin



These cockroach species are commonly associated with buildings, households and pest management professionals. Other cockroach and insect species may sometimes be reported in cases of infestations.

For more information visit:
<http://dare.uct.ac.za/~pjm2010/infestations.html>



Outdoor cockroaches in California

- Omnivorous detritivores
- Highly dependent upon moisture, humidity
- Typical habitat: water meter box, pavement voids, drains, loose mulch, compost
- Enter structures during foraging
- Warm weather = increased activity
- Landscape dry-down = water seeking behavior

Oriental cockroaches



Adults: 1 ¼ inch long,
black to brown,
flightless, males with
reduced wings

Nymphs: ¼" to 1 ¼",
reddish to dark brown

- Oriental cockroach, *Blatta orientalis*
- Live, breed in dark, damp outdoor locales
- Cannot climb slick surfaces
- Sometimes called ‘water bug’ in CA

Turkestan cockroaches



- Females: 1 inch long, dark brown, flightless
 - Males: ~ 1 inch, light brown, well-developed wings
 - Nymphs: 1/6" to 1", reddish brown
- Turkestan cockroach, *Blatta lateralis*
 - Live, breed in dark, damp outdoor locales
 - Cannot climb slick surfaces
 - Relatively new to CA



Joyce Gross Photography:
joycegross.com

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Turkestan cockroaches

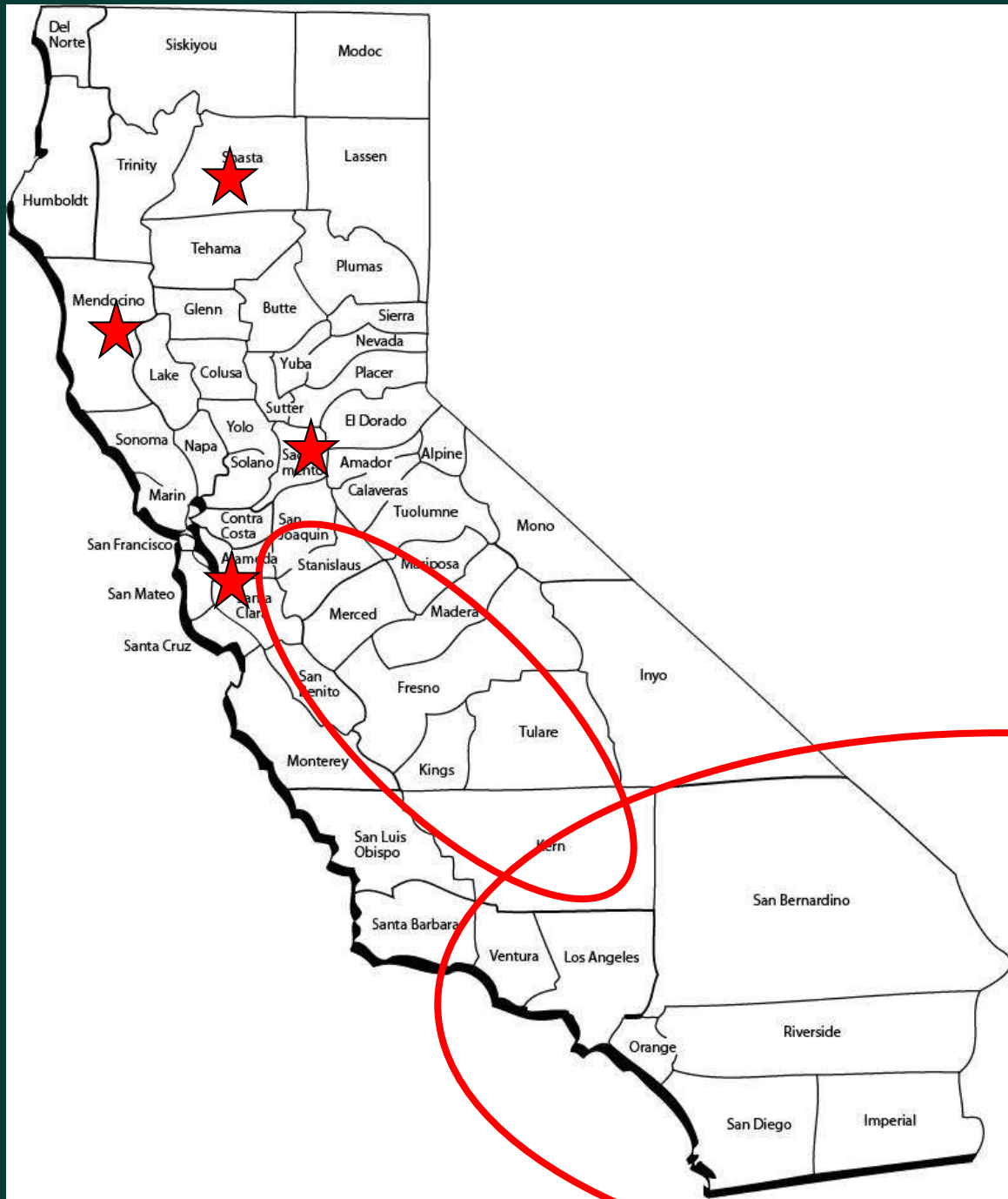


- Native to the Middle East
- Most common outdoor nuisance species in southern CA
- Becoming more common in the Central Valley (Bakersfield to Redding)
- Isolated populations elsewhere (Ukiah, San Jose)

How did they get here?



- Hitchhiking on military equipment?
 - 1978: Sharpe Army Depot (Lathrop, CA)
 - 1980s: Fort Bliss Army Depot (El Paso, TX)
- Internet sales?
 - 2000s – present day: readily available as food for reptiles, other pets, “red runners”

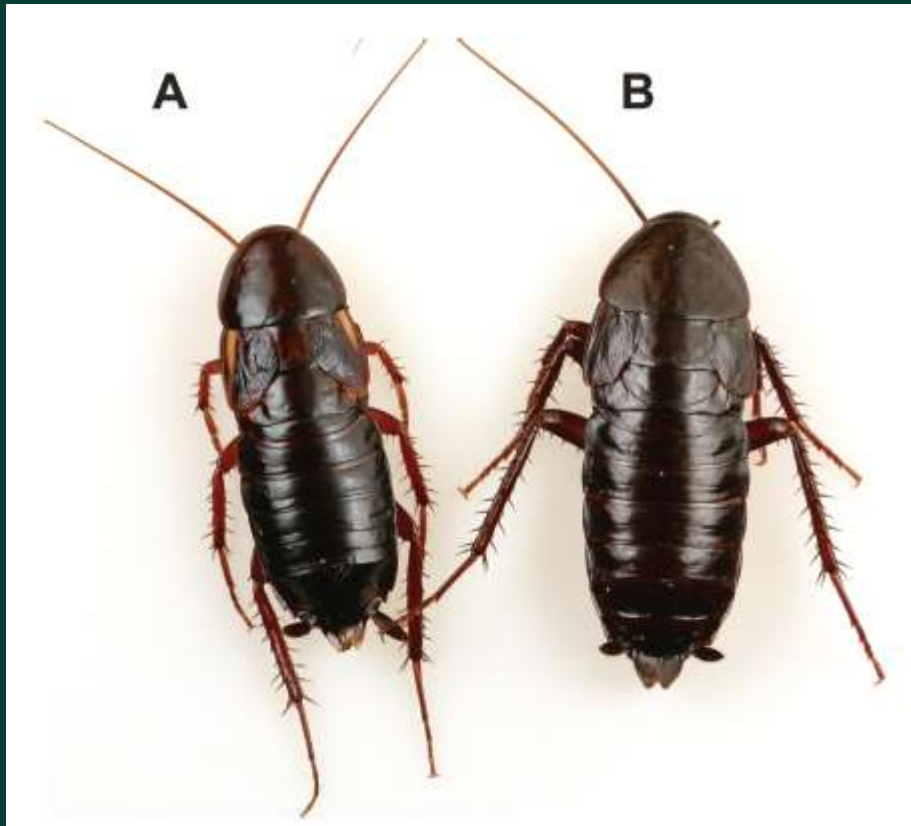


Turkestan vs. Oriental roaches

- Turkestan roach is displacing Oriental roach in much of the American SW
- Why?
 - Faster development (~ 250 d vs ~ 500 d at 25°C)
 - More egg cases produced (up to 25 vs up to 10)
 - Decreased cuticular water loss



Turkestan vs. Oriental roaches



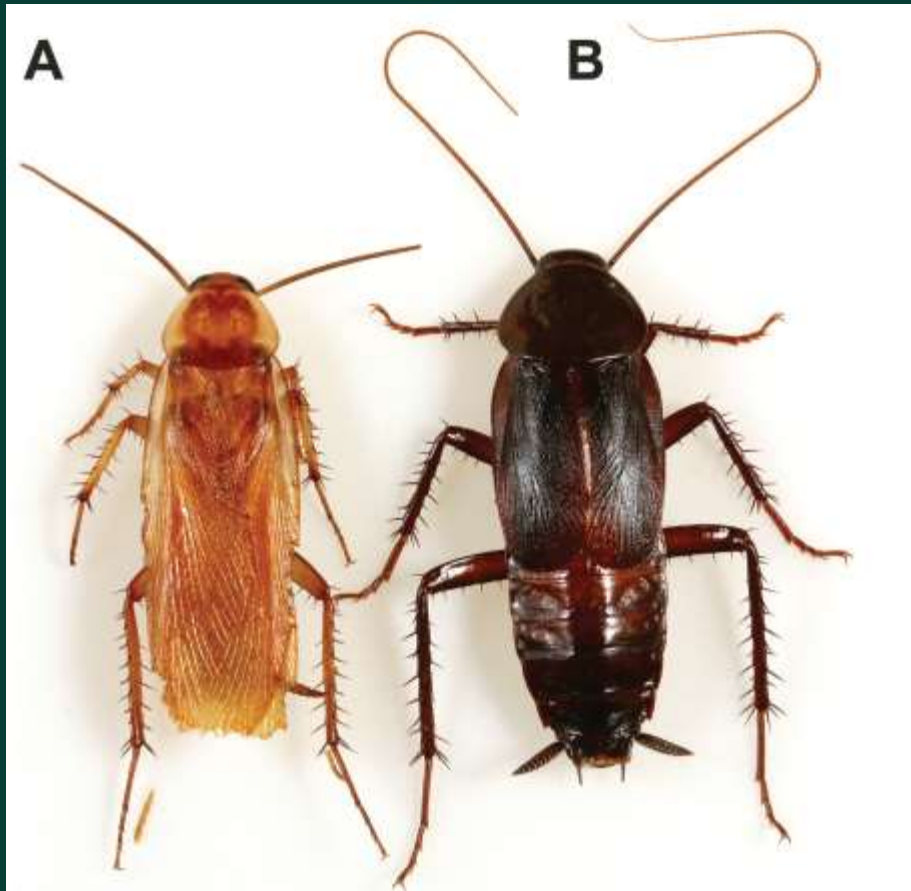
Females:

A: Turkestan

B: Oriental

- Width of thorax: space between wing buds
- Two pale stripes on Turkestan wing buds

Turkestan vs. Oriental roaches



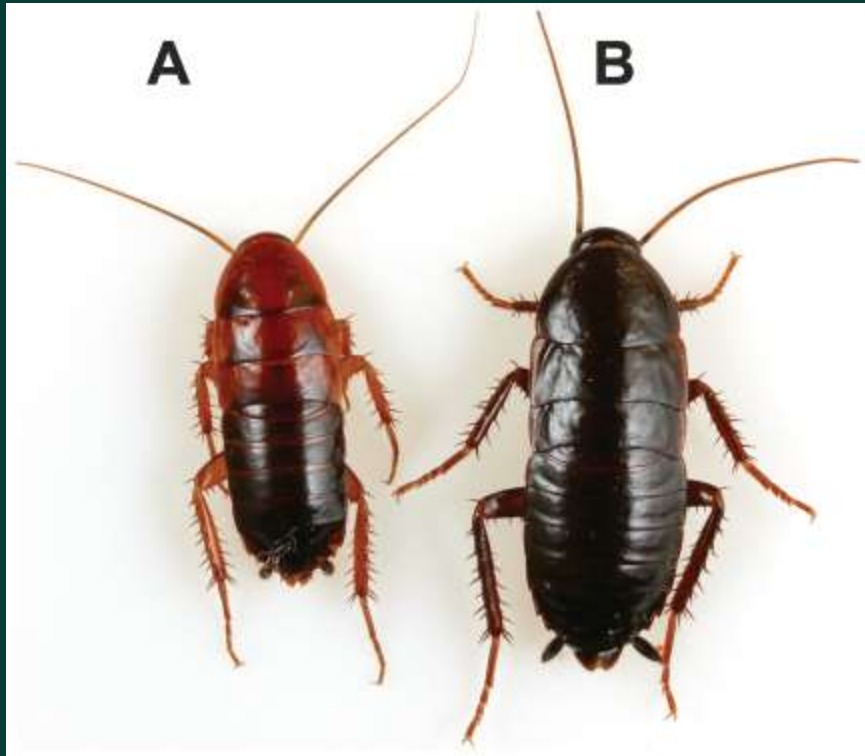
Males:

A: Turkestan

B: Oriental

- Wings: fully developed vs. brachypterous
- Base color strikingly different

Turkestan vs. Oriental roaches



Nymphs:

A: Turkestan

B: Oriental

- Turkestan nymphs slightly smaller
- Color of head and thorax differ (degree of red)

Other (large) outdoor cockroaches

- American cockroach, *Periplaneta americana*
 - Sewers, zoos
 - Warm (> 80°F), humid
 - Very large (2")
- Smokybrown cockroach, *Periplaneta fuliginosa*
 - Rare in CA
 - Landscapes, woodpiles



Another new species

- three-lined cockroach
Luridiblatta trivittata



three-lined cockroach

- Very small: adults 7 – 9 mm (1/3 inch)




- Wingless
- Detritivores
- Native to Mediterranean region
- Restricted to SF Bay Area and North Coast in CA




three-lined cockroach





New research project!




 **Andrew Sutherland, PhD, BCE**
Urban Pest Management Researcher and Educator at University of California
3w • 🌐


My program just received some funds from the [California Department of Pesticide Regulation](#) to investigate the biology and ecology of the three-lined cockroach, *Luridiblatta* (*Phyllodromica*) *trivittata* (photo: Dong-Hwan Choe), This sm ...see more





 73 • 11 Comments

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IPM for outdoor nuisance cockroaches

- Prevention
 - Moisture management
 - Habitat modification
 - Exclusion
- Monitoring
 - Sticky traps / glue boards



IPM for outdoor nuisance cockroaches

- Thresholds...
- Multiple tactics
 - Chemical tactics
 - Baits
 - Granules
 - Gels
 - Bait stations
 - Foams
 - Liquid contact
 - Liquid barriers



Problems with prevailing control programs

Information for pest management professionals and pesticide applicators

UC IPM **Green Bulletin**


University of California
Agriculture and Natural Resources

Vol. 3 • No. 1 • November 2012

New Restrictions on Pyrethroid Insecticide Applications Protect Urban Surface Waters

On July 19, California's Department of Pesticide Regulation (DPR) introduced new regulations for pyrethroid insecticide applications made in outdoor nonagricultural settings (California Code of Regulations, Title 3, Division 6, Sections 6000, 6970, and 6972: http://www.cdpr.ca.gov/docs/legbills/calcode/chapter_.htm). The United States Environmental Protection

toxic to indicator species representing the small arthropods that make up the base of the aquatic food web. The new regulations address applications of 17 different active ingredients (Table 1; see Page 3) during rain, to standing water, to areas in close proximity to surface waters, and to horizontal and vertical impervious surfaces.



- **Restrictions on active ingredients (surface water protection)**
- **Sensitive sites (schools)**
- **Poor efficacy (resistance?)**

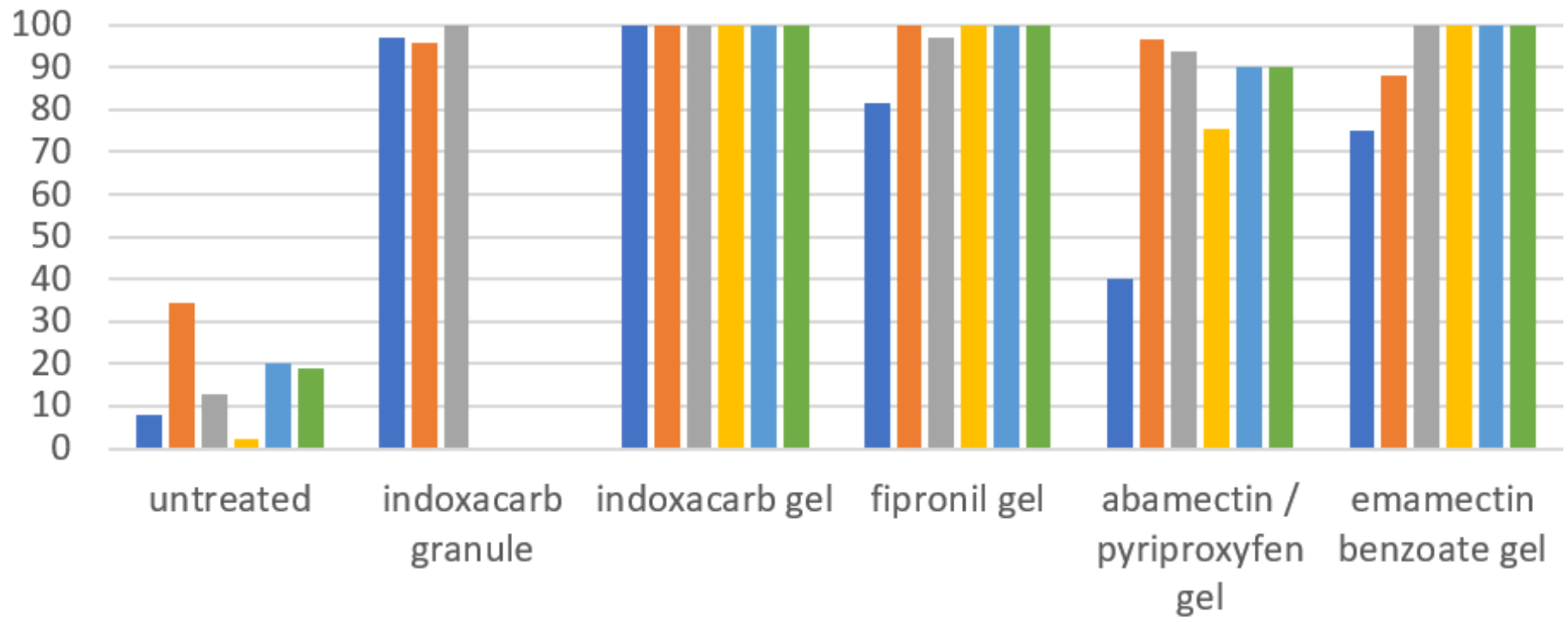
Bait Evaluations: Lab Methods

- Lab of Professor Mike Rust (UC Riverside)
 - Plastic containers
 - + 5 ♂, 5 ♀, 25 nymphs
 - + 1 g bait (14 d exposure) as fresh or aged (7 d) deposit



product	active ingredient, formulation
Advion Cockroach Gel Bait (Syngenta)	0.6% indoxacarb, gel
Advion Insect Granule (Syngenta)	0.22% indoxacarb, granule
MaxForce FC Magnum Roach Bait (Bayer)	0.5% fipronil, gel
Optigard Cockroach Bait (Syngenta)	0.1% emamectin benzoate, gel
Vendetta Plus Cockroach Gel Bait (MGK)	0.05% abamectin B1, 0.50% pyriproxyfen, gel

laboratory mortality (%) of *Blatta* cockroaches after 14 days exposure to various baits



■ nymphs* ■ females* ■ males* ■ nymphs** ■ females** ■ males**

* indicates Turkestan cockroaches exposed to fresh bait deposits

** indicates oriental cockroaches exposed to gel bait allowed to dry for seven days within the laboratory

Bait Evaluations: Lab Results Summary

- Baits tested were extremely effective against both species
- Males easiest to kill, nymphs most difficult
- Aged (7 – 14 D @ 20% RH) baits remained very effective
- Activity may be due to contact rather than ingestion (very little eaten) in some cases

Field demonstrations: Turkestan cockroach control at public schools

- Mendocino County, Riverside County
- CA Healthy Schools Act requirements
 - no sprays, bait within stations only



Case study: Turkestan cockroaches in public schools

- New approaches:
 - Extensive structural exclusion / habitat modification
 - Hardscape sealing
 - indoxacarb (Advion) and clothianidin (Maxforce Impact) baits
 - Granules in dry, inaccessible harborages
 - Gels in locked stations in wet harborages
 - thiamethoxam (Optigard) foam



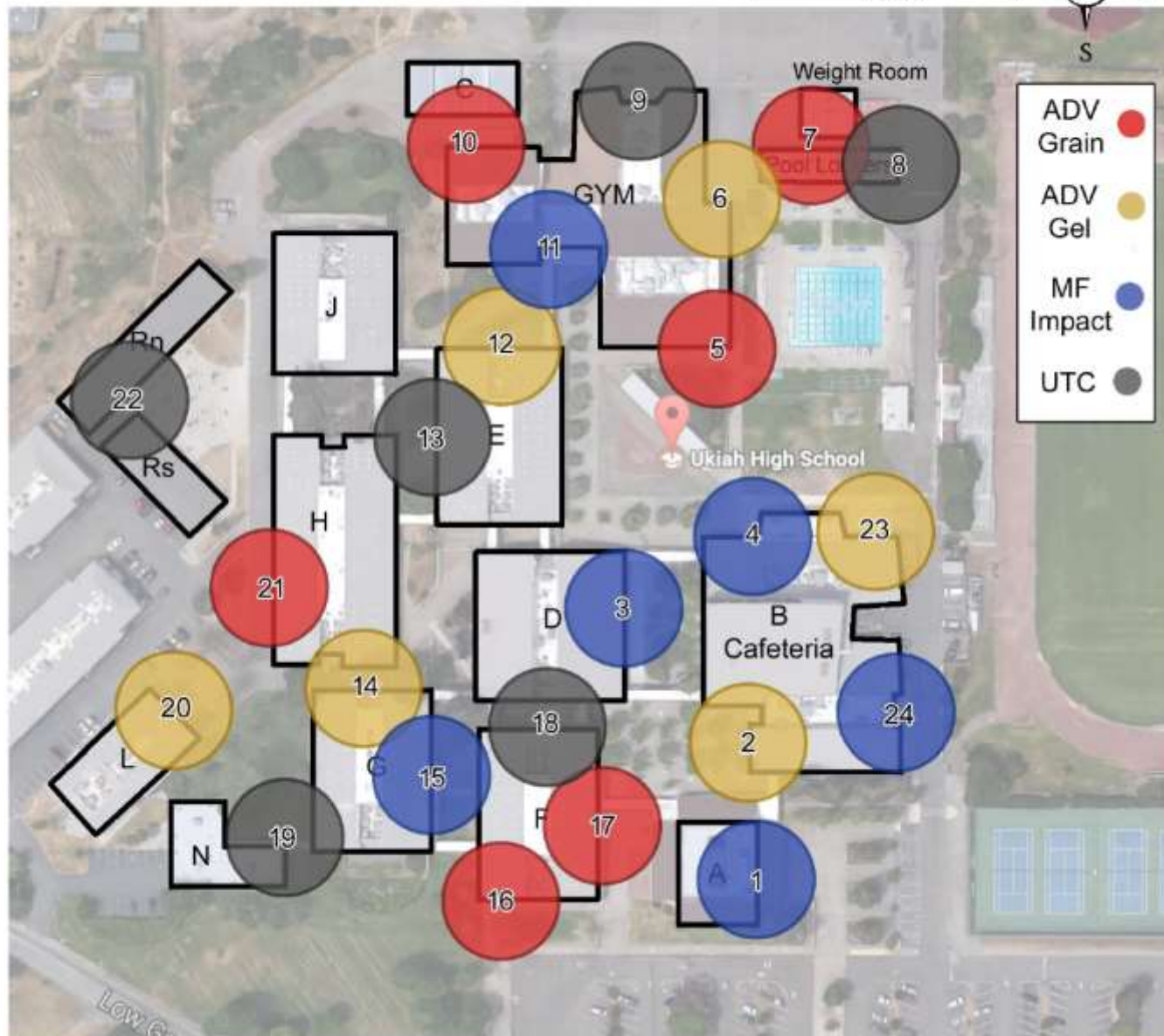
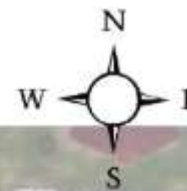
Structural exclusion and habitat modification





product	active ingredient, formulation	application rates, frequencies used, Mendocino County	application rates, frequencies used, Riverside County
Advion Cockroach Gel Bait (Syngenta)	0.6% indoxacarb, gel	3 g / bait placement, 12 g per treatment area, monthly June 2017 – October 2017 and March 2018 – June 2018	1 g – 3 g / bait placement, 4 g – 12 g per treatment area, two applications: October 2017 and July 2018
Advion Insect Granule (Syngenta)	0.22% indoxacarb, granule	3 g / bait placement, 12 g per treatment area, monthly June 2017 – October 2017 and March 2018 – June 2018	1 g – 3 g / bait placement, 4 g – 12 g per treatment area, two applications: October 2017 and July 2018
MaxForce Impact Roach Gel Bait (Bayer)	1.0% clothianidin, gel	3 g / bait placement, 12 g per treatment area, monthly June 2017 – October 2017 and March 2018 – June 2018	1 g – 3 g / bait placement, 4 g – 12 g per treatment area, two applications: October 2017 and July 2018

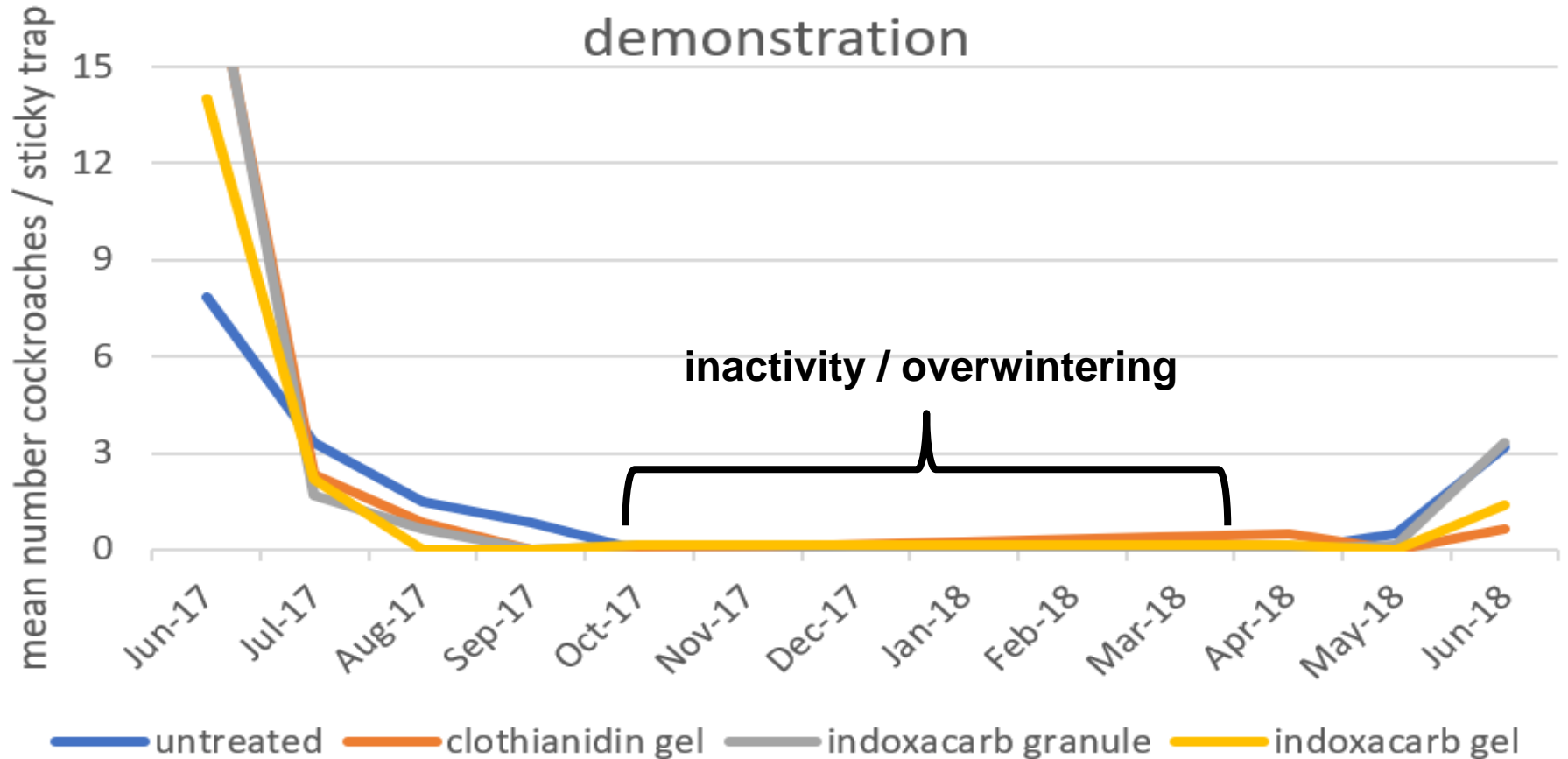
Ukiah High School





Mendocino County, very high density

observed decreases in Turkestan cockroach density during a one-year bait-only IPM demonstration



Note: no bait was applied and no data were collected during the period of inactivity / overwintering (October - March)



Southern CA Field Study

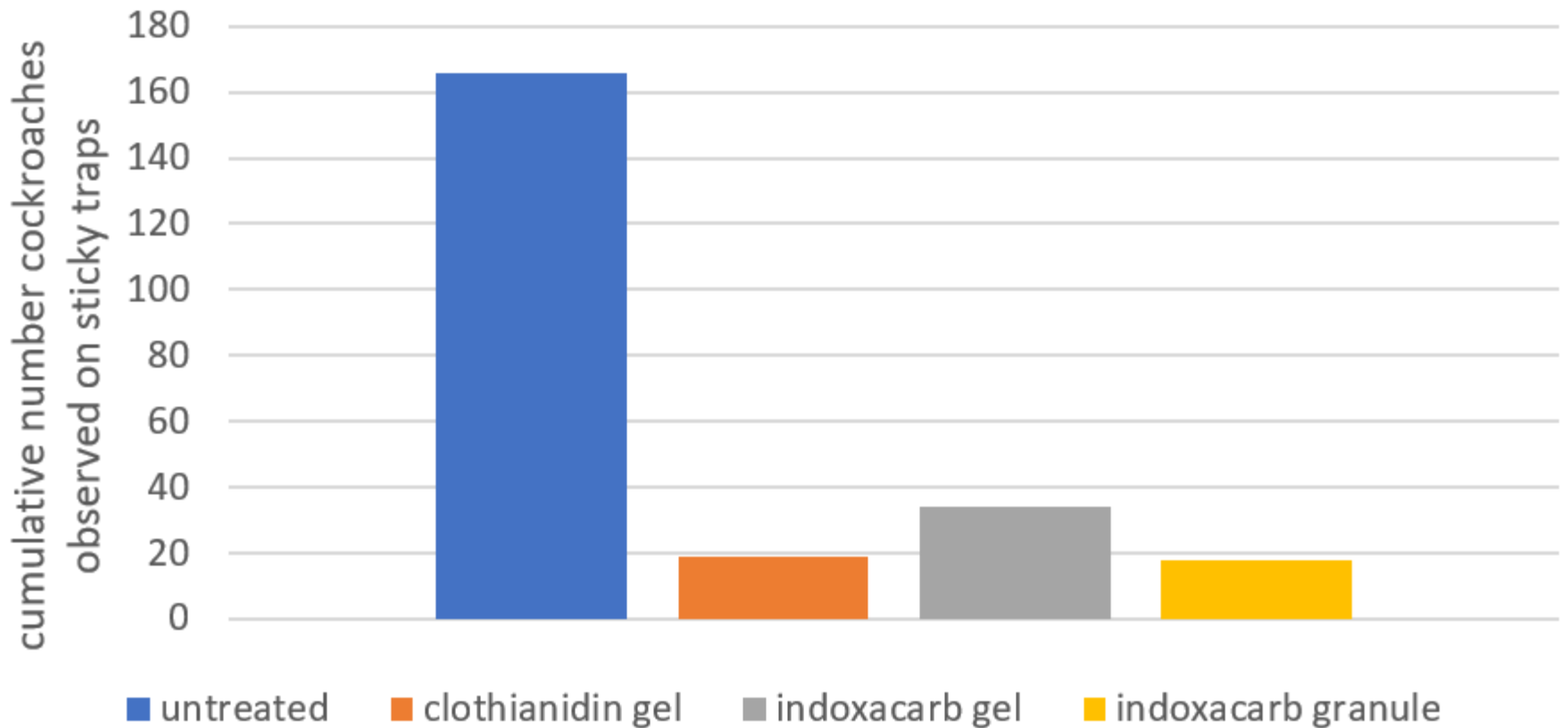
- Midland Elementary; Moreno Valley (Riverside County)
- Turkestan cockroaches present at lower density, some complaints (staff, students)





Riverside County, low – moderate density

cumulative Turkestan cockroach density during a one-year bait-only IPM program



Bait Evaluations: Field Results Summary

- Exclusion tactics have been successful
- All baits tested appear to be extremely effective against both *Blatta* species
- Targeted foams have been successful
- Entire population appears to have crashed at northern CA site (foraging ranges may be large)
- Significant reductions at southern CA site

Overall Project Findings

- Outdoor bait-only programs can be used to manage *Blatta* cockroaches in CA
- Targeted foam applications can be used to help reduce large populations
- Such programs help manage insecticide resistance and can be used at sensitive sites or when regulations do not allow for perimeter sprays

Collaborators

- Casey Hubble-Wirgler, UCCE Alameda
- Michael Rust, UC Riverside
- Siavash Taravati, UCCE Los Angeles
- Kathleen Campbell, UC Riverside
- Dong-Hwan Choe, UC Riverside



Thanks!...Questions?

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