

# Bedbug reproduction and behavior

Dr. Gale E. Ridge

Connecticut Bedbug Forum VII  
Middlesex Community College  
Middletown, Connecticut  
April 11, 2013



**KEEP  
CALM  
AND  
BED BUGS  
BEGONE**



(203) 974-8600  
[WWW.CT.GOV/CAES/CCABB](http://WWW.CT.GOV/CAES/CCABB)

# The narrative.....

**“During her lifetime, she may lay from 200 to 500 viable eggs. Eggs are laid individually and mostly close to the females harborage site”.  
Bed Bug Handbook. Pinto, Cooper, and Kraft.**

**“Each female may lay 1-3 eggs/day and 200-500 eggs during her adult lifetime...”  
Armed Forces Pest Management Board, Technical Guide No. 44..Bed Bugs –  
Importance and Control Strategies**

**Fertilized females with enough food will lay three to four eggs each day....possibly  
generating as many as 500 eggs in this time”  
Wikipedia**

**Bedbugs produce 200 to 500 eggs in a lifespan of 12 to 18 months.  
Patricia Espinosa, Online Mission local, a news lab for everyone.”**

***Titschack, 1930 reported 541 eggs being produced by a single  
female over her lifetime***

# Experiment

1. May 16, 2011 - 50 2<sup>nd</sup> instar nymphs
2. Reared separately until adults

3. **Tests**  
8 male Harlan X 8 female Ridge  
8 male Ridge X 8 female Harlan

## Controls

- 3 male Harlan x 3 female Harlan
- 3 male Ridge X 3 female Ridge

(One nymph died and five were extra)

4. Each pairing fed and mated for 1 hour every Friday morning for duration of natural reproductive life. Each week black tabs on which previous weeks eggs were laid, were exchanged with new tabs and placed in vials to allow nymphs to hatch.



# Mating



Active mating



Mate guarding

## *Female choice*

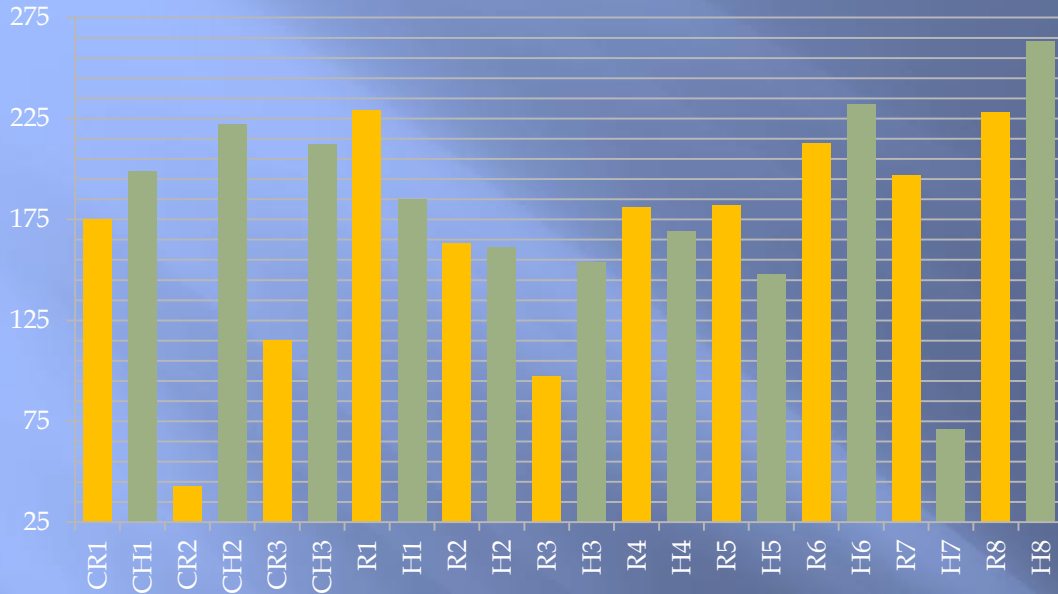
- Females will refused to feed to avoid mating
- Females will “buck” off suitors to prevent mating

## *Male on male mounting*

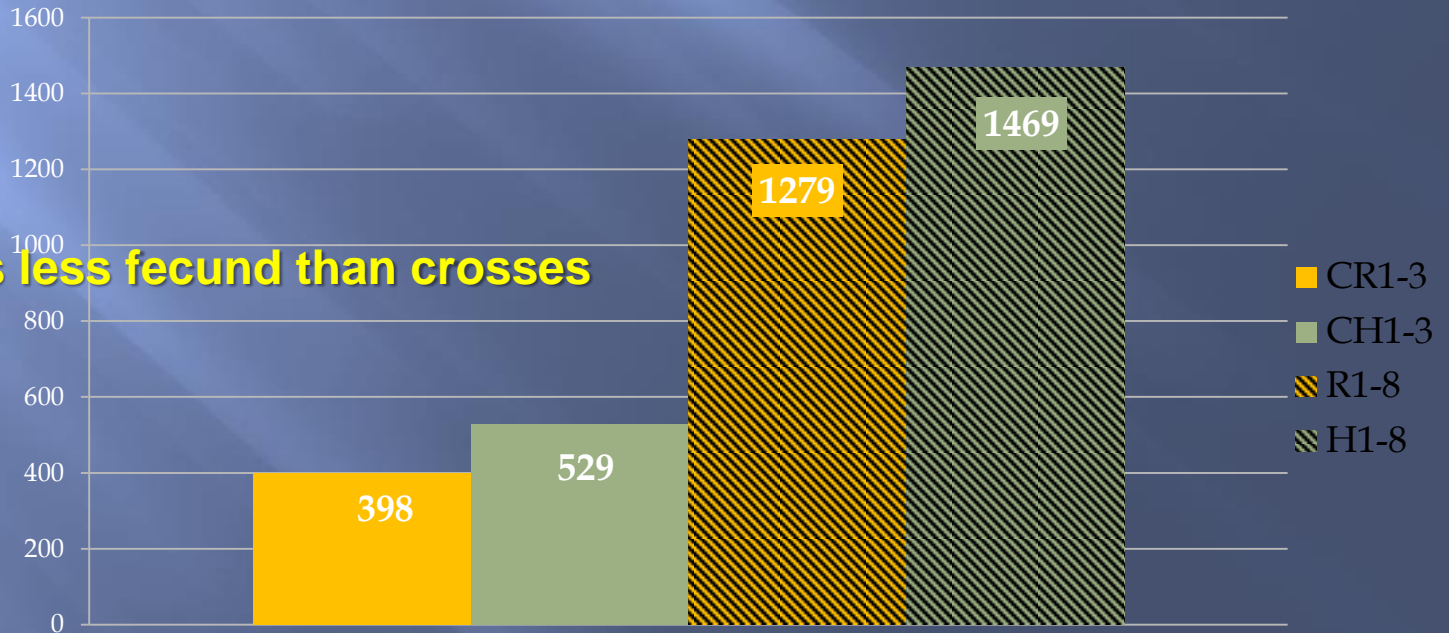
- Males will shake off mounting males and back them off using pheromones
- Harlan females tended to lay more eggs earlier during weekly cycles and total reproductive life than the Ridge line females.



## Laboratory line vs. wild line fecundity numbers snap shot in time



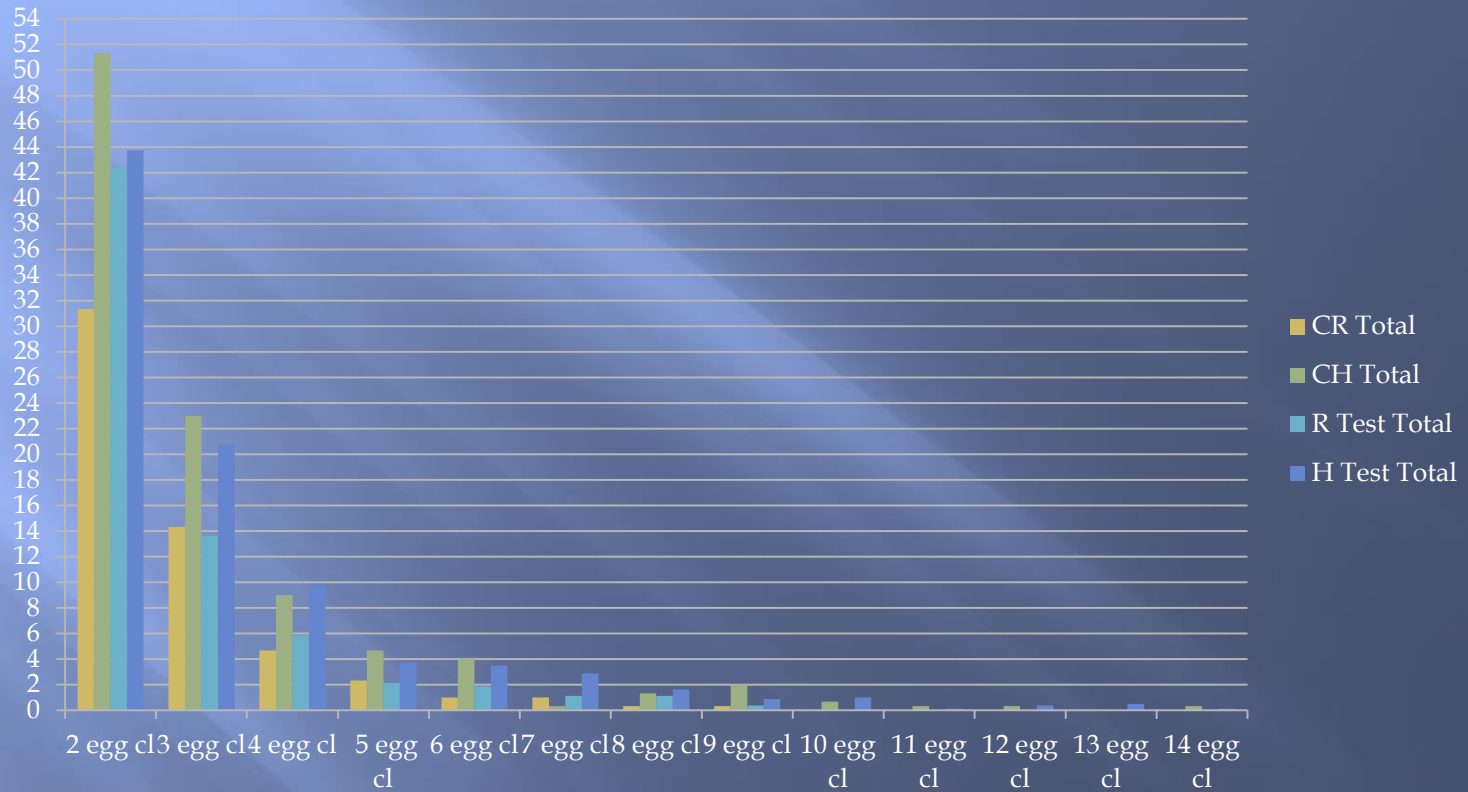
Pure-lines less fecund than crosses



# Female reproductive life egg production totals (237 average)

	11/19/2011	11/25/2011	12/2/2011	12/9/2011	12/16/2011	12/23/2011	12/30/2011	1/6/2012	1/13/2012	1/20/2012	1/27/2012	2/3/2012	2/10/2012	2/17/2012	2/24/2012	3/2/2012	3/9/2012	3/16/2012	3/23/2012	3/30/2012	4/6/2012	4/13/2012	4/20/2012	4/27/2012	5/4/2012	5/11/2012	5/19/2012	5/27/2012	6/4/2012	6/11/2012	6/18/2012	6/25/2012	7/2/2012	Cumulative Total Egg Production	Average egg prod per wk			
CR 1	8	7	14	11	11	13	13	12	12	11	12	12	10	7	12	10	11	11	9	4	3	14	5	0	3	0	0	0	0	0	0	0	0	0	235	7.12		
CR 2	13	6	18	12	12	17	10	13	13	14	8	19	9	14	12	9	12	15	10	12	3	14	7	1	0	0	0	0	0	0	0	0	0	0	273	8.27		
CR 3	15	7	13	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	1.3			
CH 1	12	5	15	9	8	10	7	8	8	8	6	10	6	7	8	6	7	8	6	5	2	9	4	0	1	0	0	0	0	0	0	0	0	0	277	8.39		
CH 2	10	6	12	14	13	6	9	9	4	7	6	10	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115	3.48		
CH 3	10	10	17	14	18	14	12	17	10	16	13	13	14	12	15	7	4	7	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	231	7	
R1	12	8	18	17	16	11	11	13	9	11	3	11	10	10	9	6	7	6	5	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6.29		
R2	13	8	17	17	13	17	14	14	14	15	15	14	17	14	12	15	11	16	12	12	11	18	11	10	7	16	13	9	6	17	16	8	7	429	13			
R3	16	9	20	14	13	16	13	13	9	13	10	12	9	10	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	185	5.61	
R4	7	1	8	14	12	13	13	15	8	7	18	12	4	9	14	8	8	16	8	9	5	17	7	2	0	8	5	2	5	4	0	0	0	0	259	7.85		
R5	7	5	8	9	12	12	7	11	11	12	11	11	14	10	11	10	8	13	9	11	4	16	4	11	7	6	13	0	0	0	0	0	0	0	263	7.97		
R6	15	9	8	8	10	12	5	10	9	5	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	2.94		
R7	10	7	11	15	8	8	12	11	9	9	9	12	7	8	9	9	3	8	4	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	178	5.39	
R8	11	13	14	16	10	14	8	11	11	5	12	17	10	11	8	10	9	15	8	9	6	7	1	3	0	0	0	0	0	0	0	0	0	0	0	239	7.24	
R9	10	3	9	15	8	16	14	10	9	10	13	14	13	13	7	5	5	9	9	4	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	199	6.03	
H1	11	6	12	14	11	14	10	12	10	9	12	12	9	9	8	7	5	9	6	6	4	7	3	3	1	3	3	1	1	2	2	1	0	0	7			
H2	12	8	13	12	10	17	17	9	8	13	9	12	15	10	7	10	11	15	11	9	10	15	10	3	12	0	0	0	0	0	0	0	0	0	0	278	8.42	
H3	4	7	15	17	13	11	8	5	6	5	10	6	10	9	13	9	18	18	14	15	6	18	8	9	2	0	2	0	0	0	0	0	0	0	0	258	7.82	
H4	15	8	14	19	15	16	13	14	15	13	17	11	15	14	7	7	13	8	11	9	9	18	9	3	0	13	14	1	0	0	0	0	0	0	0	321	9.73	
H5	17	14	22	20	16	19	16	14	12	13	14	12	7	16	10	10	10	10	5	4	1	3	3	3	0	1	0	0	0	0	0	0	0	0	0	272	8.24	
H6	16	11	28	26	20	18	9	18	8	8	10	3	2	7	8	5	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	203	6.15
H7	14	9	19	9	4	5	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	2.15	
H8	17	10	19	19	17	16	16	13	15	11	14	14	9	9	17	12	2	5	14	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	252	7.64
H9	19	13	25	22	17	20	18	20	17	15	21	14	10	9	11	12	11	11	11	9	7	6	1	0	0	8	8	7	6	5	7	0	0	0	0	360	10.9	
H10	14	10	19	18	14	15	12	10	9	8	12	9	8	11	9	8	8	9	8	6	4	7	3	2	1	2	2	3	1	8	6	9	0	0	0	0		

# Bedbug egg clusters





# The eggs



# Egg laying insurance policy





# Failures





# Hatching failure





# Hitchhiking





# Conclusion

## Reproductive life

10/28/2011 to 7/22/2012 = 9 months maximum

10/28/2011 to March 2013 to May 2013 = 5 to 7 months (range in Lab.)

## Egg production

Wild line needs more waiting time to produce egg, post each mating, have a longer reproductive life, and fewer eggs. All produce 1 to 3 eggs per day. Total egg production variable between populations.

## Mate guarding

Laboratory line males mate guard far more frequently than wild line

## Female egg laying

Females possess individual behaviors for egg laying.  
All females lay some eggs in isolation from the main clutch.  
Pure-lines were slightly less fecund than crosses

## Nymphs hitchhike

Nymphs hitchhike on adults

# Other research

- Use of Ivermectin to manage bedbugs

Dr. John Sheele et al.

Eastern Virginia Medical School

Moved to Case Western Reserve University, Ohio

Future collaboration is planned

- Bean leaf hairs impaling of bedbugs

Dr. Catherine Loudin

University of California

- Fungus research



# Thank you

**GIVE BED BUGS THE ...**



 [WWW.CT.GOV/CAES/CCA\(BB](http://WWW.CT.GOV/CAES/CCA(BB)  

Connecticut Department of Public Health