



**COCOA RESEARCH (UK)**

**ISOLATION AND CHARACTERISATION OF  
THE FEMALE SEX PHEROMONE OF  
*Helopeltis theivora*  
(2008-2010)**

*Bah Lias Research Station,  
PTPP London Sumatra, Indonesia  
Natural Resources Institute, UK*

# *Helopeltis theivora* FIELD EXPERIMENT 1

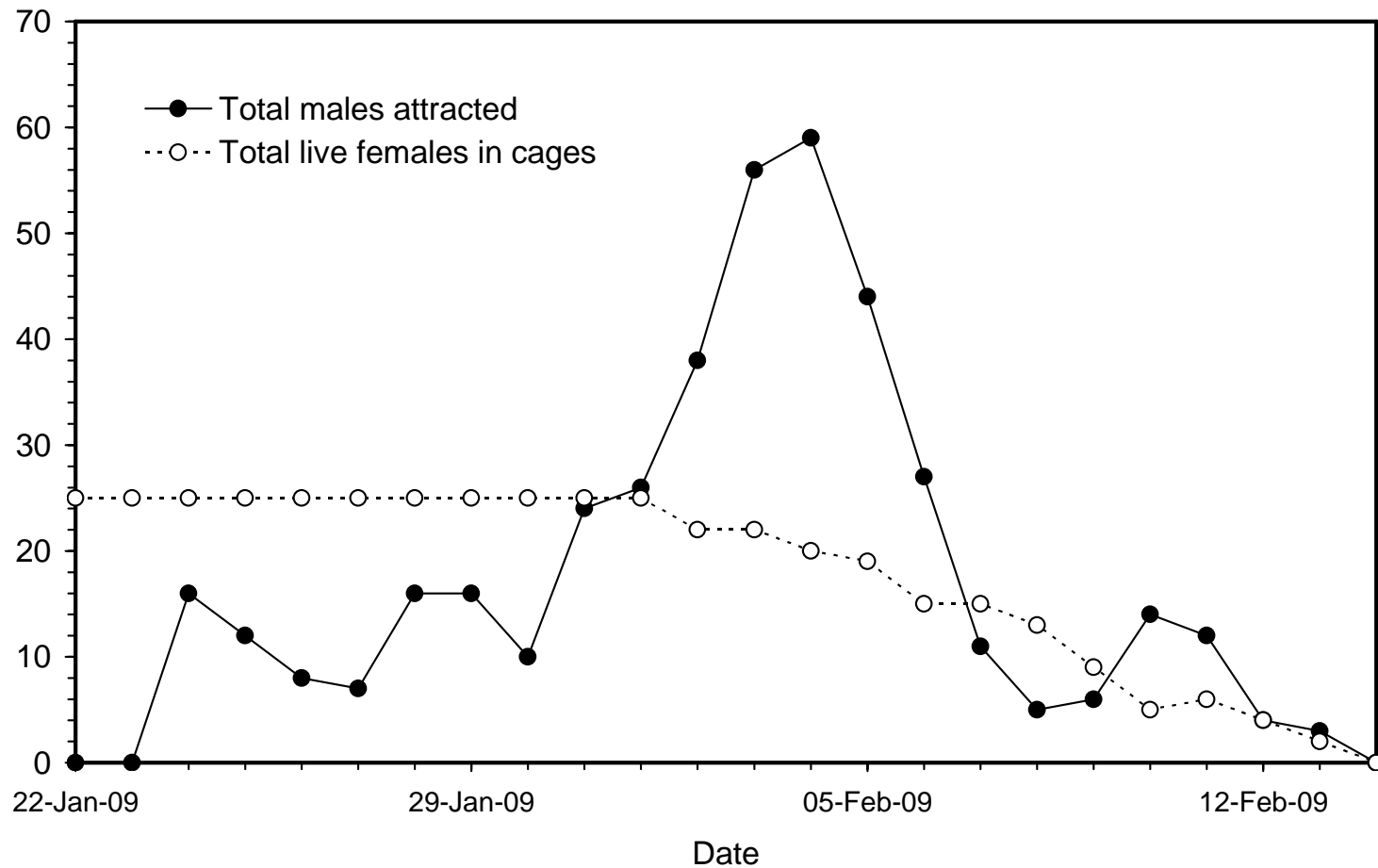


Observation of 5 virgin females or 5 virgin males in muslin cages, 3 m apart; 5 replicates observed continuously

# *Helopeltis theivora* FIELD EXPERIMENT 1

## ATTRACTION BY FEMALES

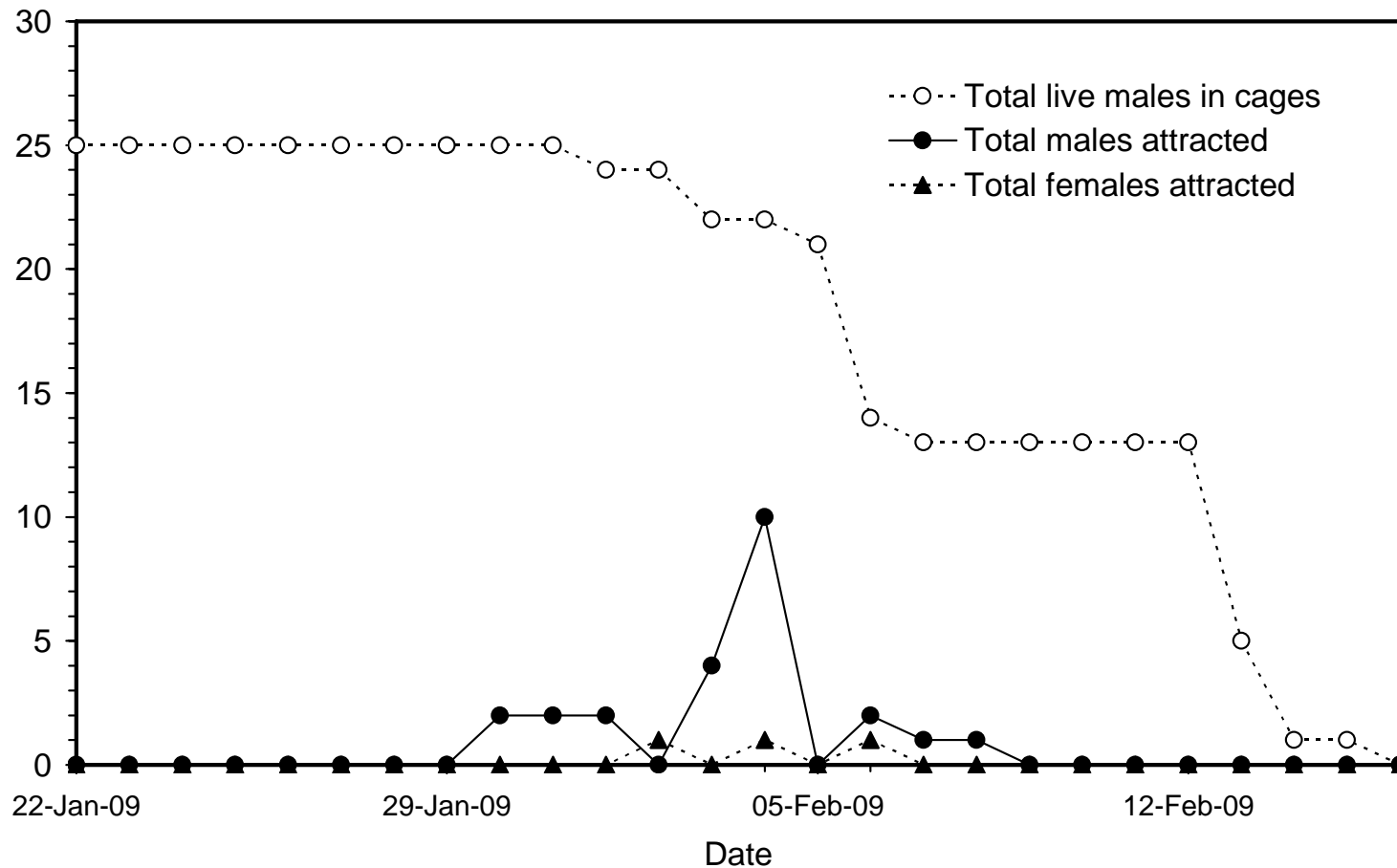
(414 males and 0 females in 5 reps over 24 days)



# *Helopeltis theivora* FIELD EXPERIMENT 1

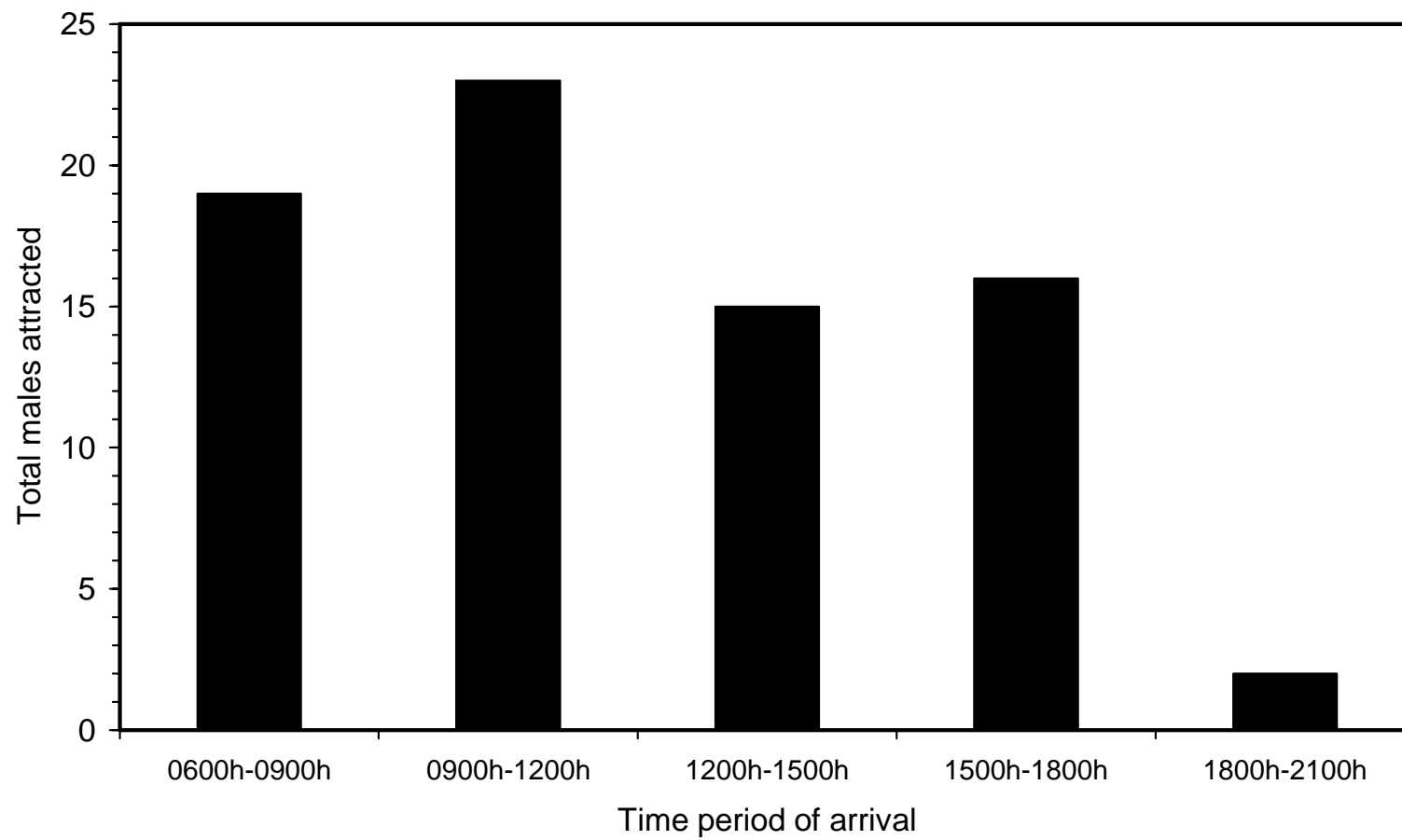
## ATTRACTION BY MALES

(24 females and 3 males in 5 reps over 24 days)



# *Helopeltis theivora* FIELD EXPERIMENT 1

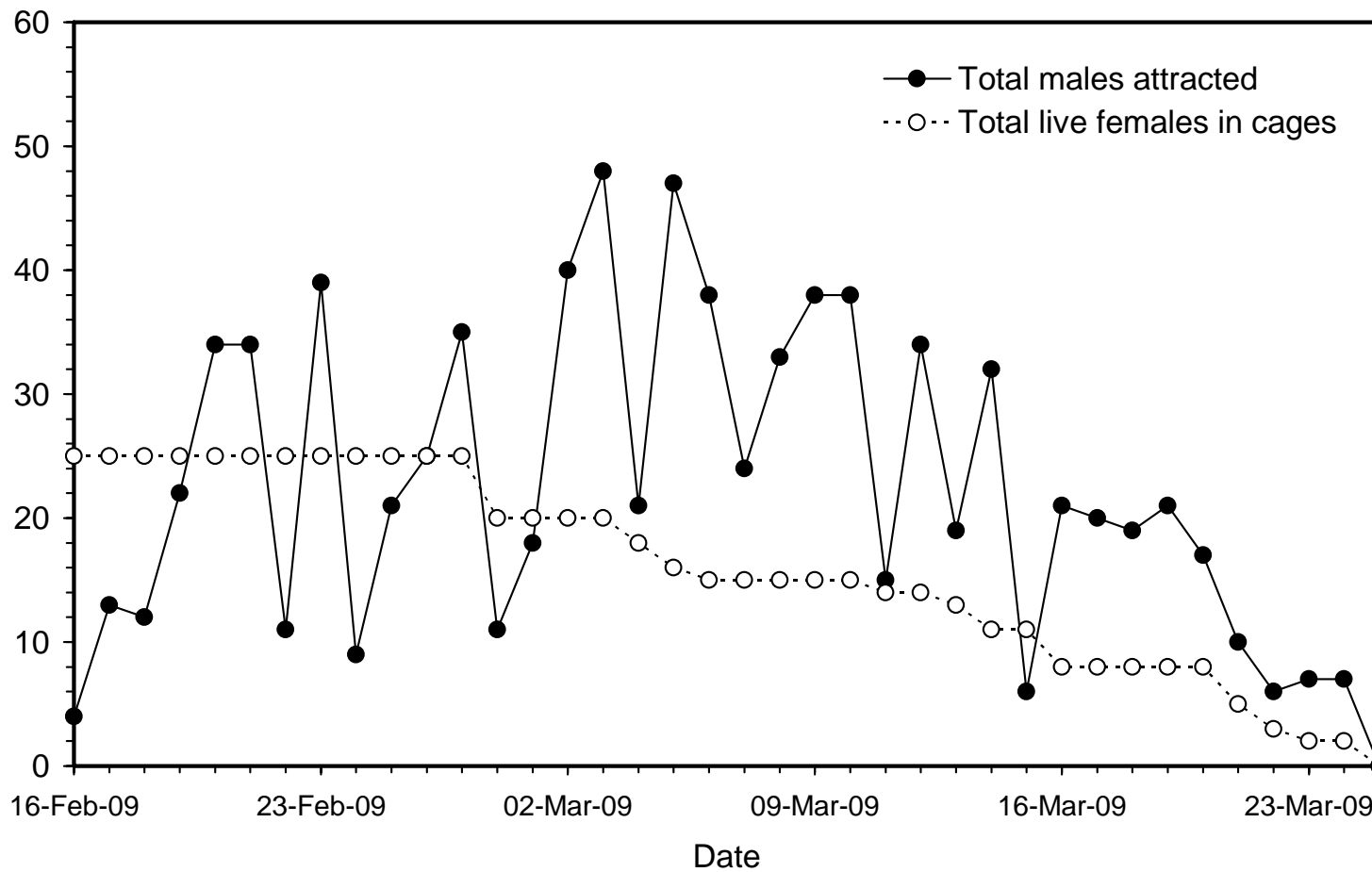
## ATTRACTION OF MALES BY FEMALES



# *Helopeltis theivora* FIELD EXPERIMENT 2

## ATTRACTION BY FEMALES

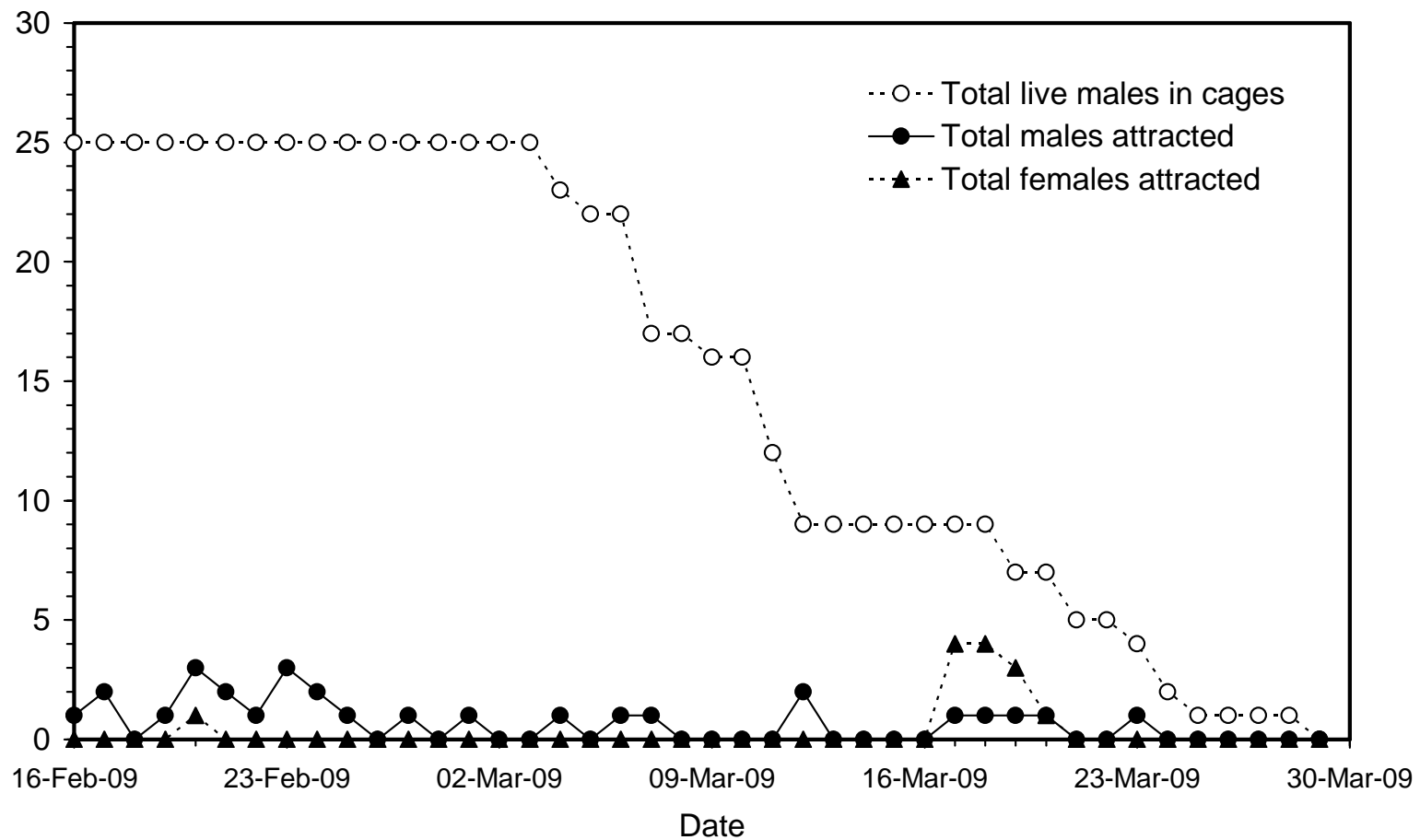
(849 males and 10 females in 5 reps over 38 days)



# *Helopeltis theivora* FIELD EXPERIMENT 2

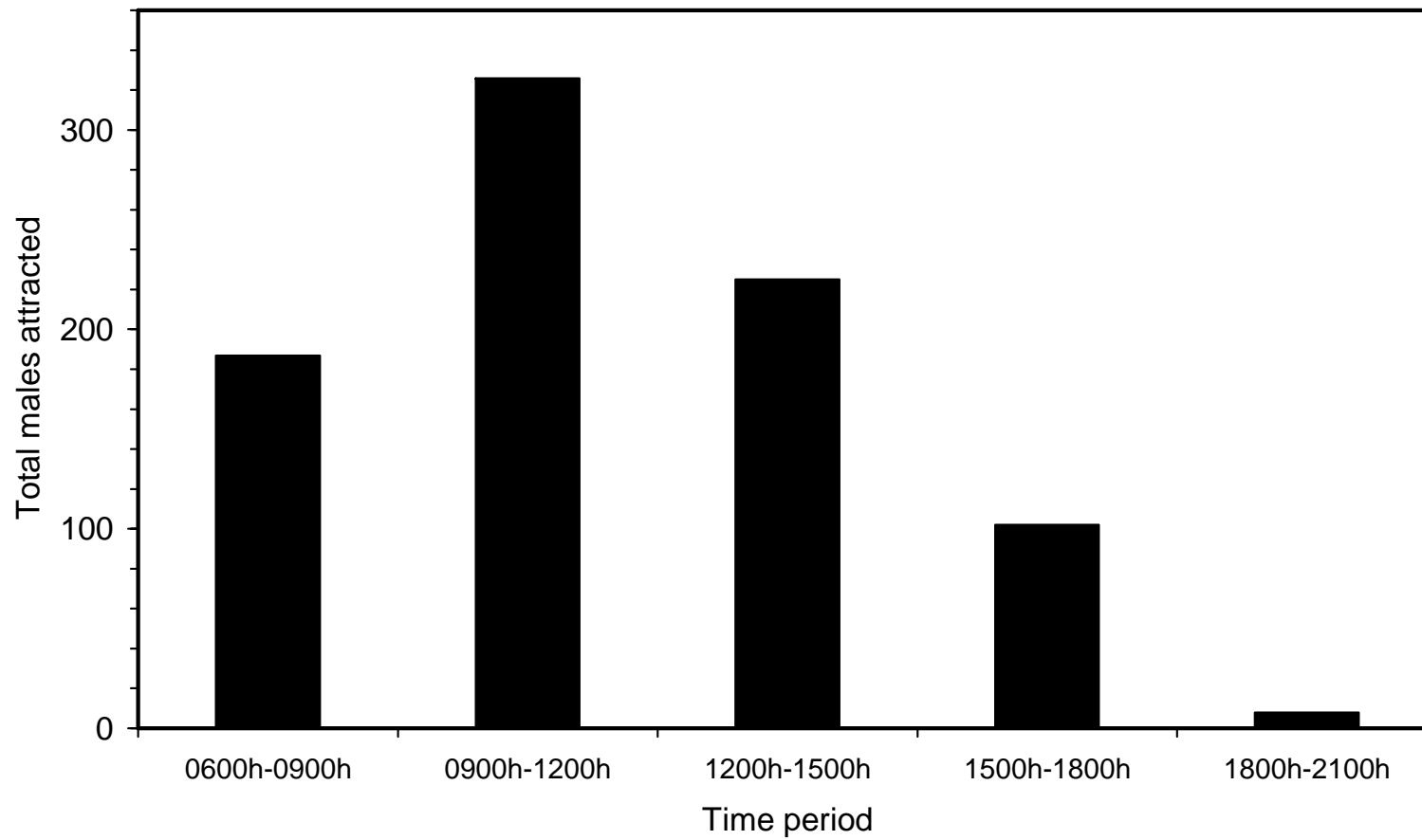
## ATTRACTION BY MALES

(28 males and 13 males in 5 reps over 38 days)



# *Helopeltis theivora* FIELD EXPERIMENT 2

## ATTRACTION OF MALES BY FEMALES





## CONCLUSIONS

- *H. theiovora* lived 20-38 days in muslin cages
- Mated up to 4 times
- Virgin females attract males
- Virgin males possibly attract males and females?
- Attraction through day but not after dark



# *Helopeltis bradyi* FIELD EXPERIMENT

## *Helopeltis bradyi*

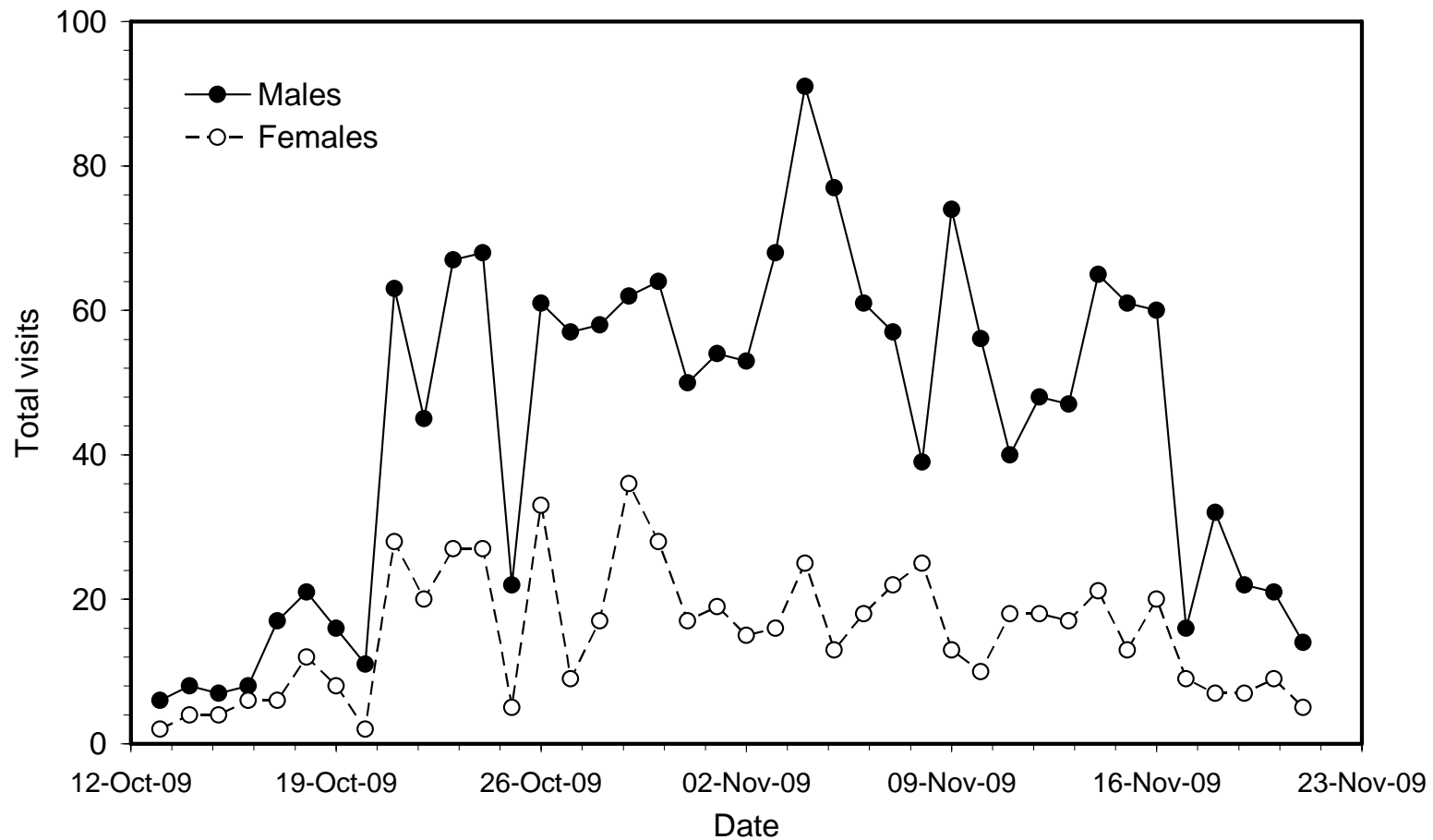
- 5 virgin females
- 5 virgin males
- cocoa pod only
- blank
- 4 replicates each
- 13 October – 21 November 2009



# *Helopeltis bradyi* FIELD EXPERIMENT

## ATTRACTION BY FEMALES

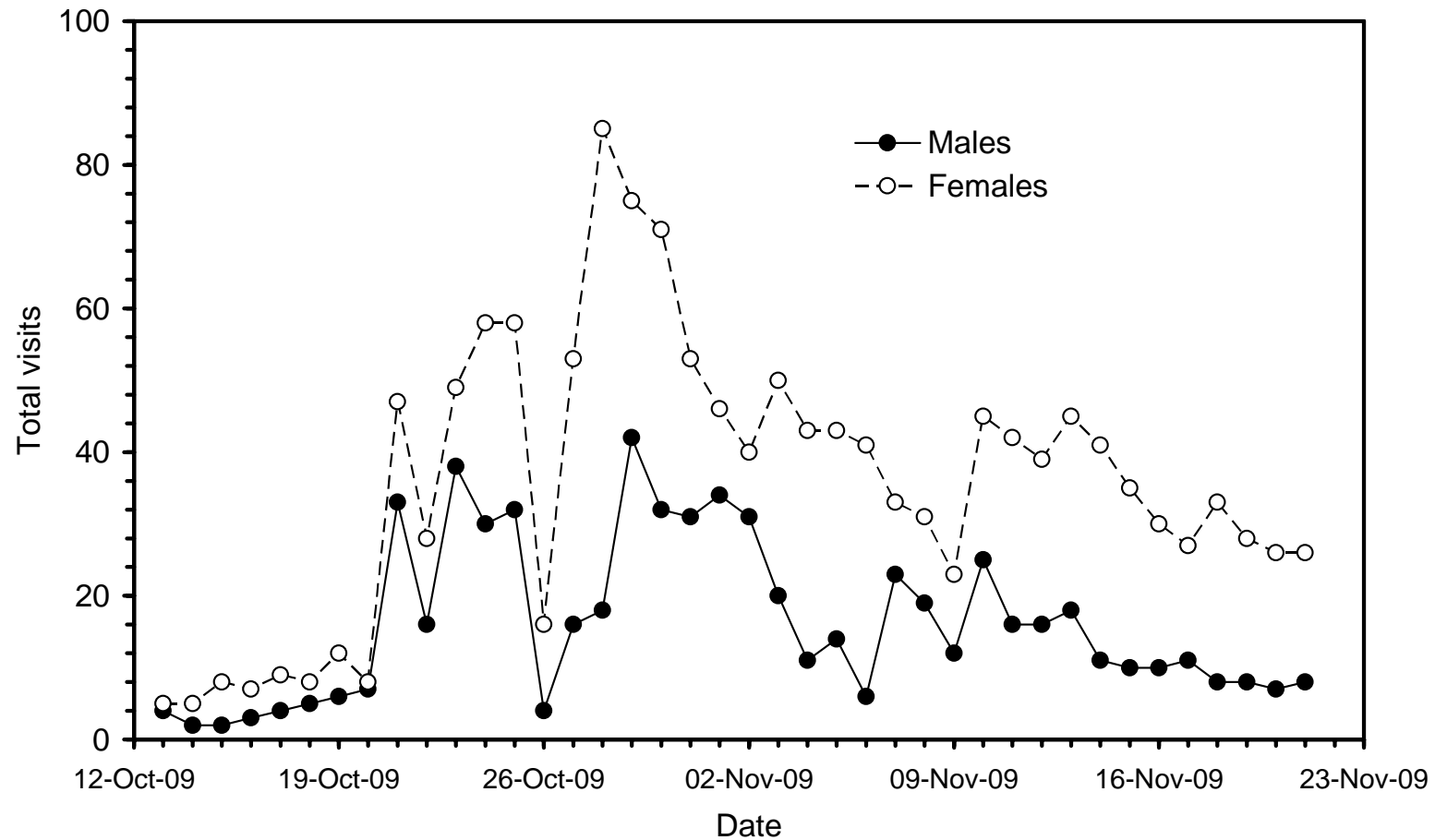
(1767 males and 611 females in 4 reps over 39 days)



# *Helopeltis bradyi* FIELD EXPERIMENT

## ATTRACTION BY MALES

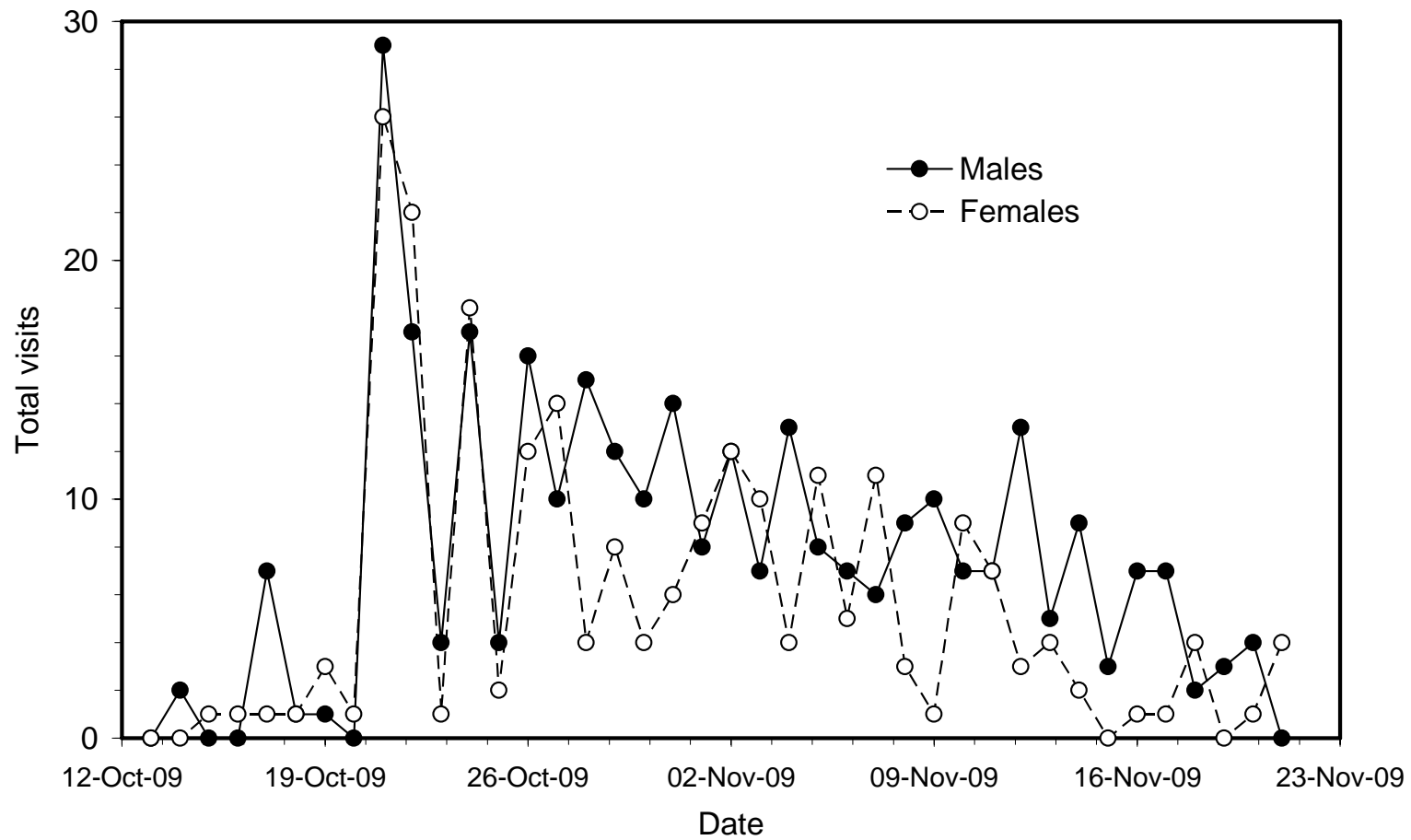
(1422 females and 643 males in 4 reps over 39 days)



# *Helopeltis bradyii* FIELD EXPERIMENT

## ATTRACTION BY COCOA PODS

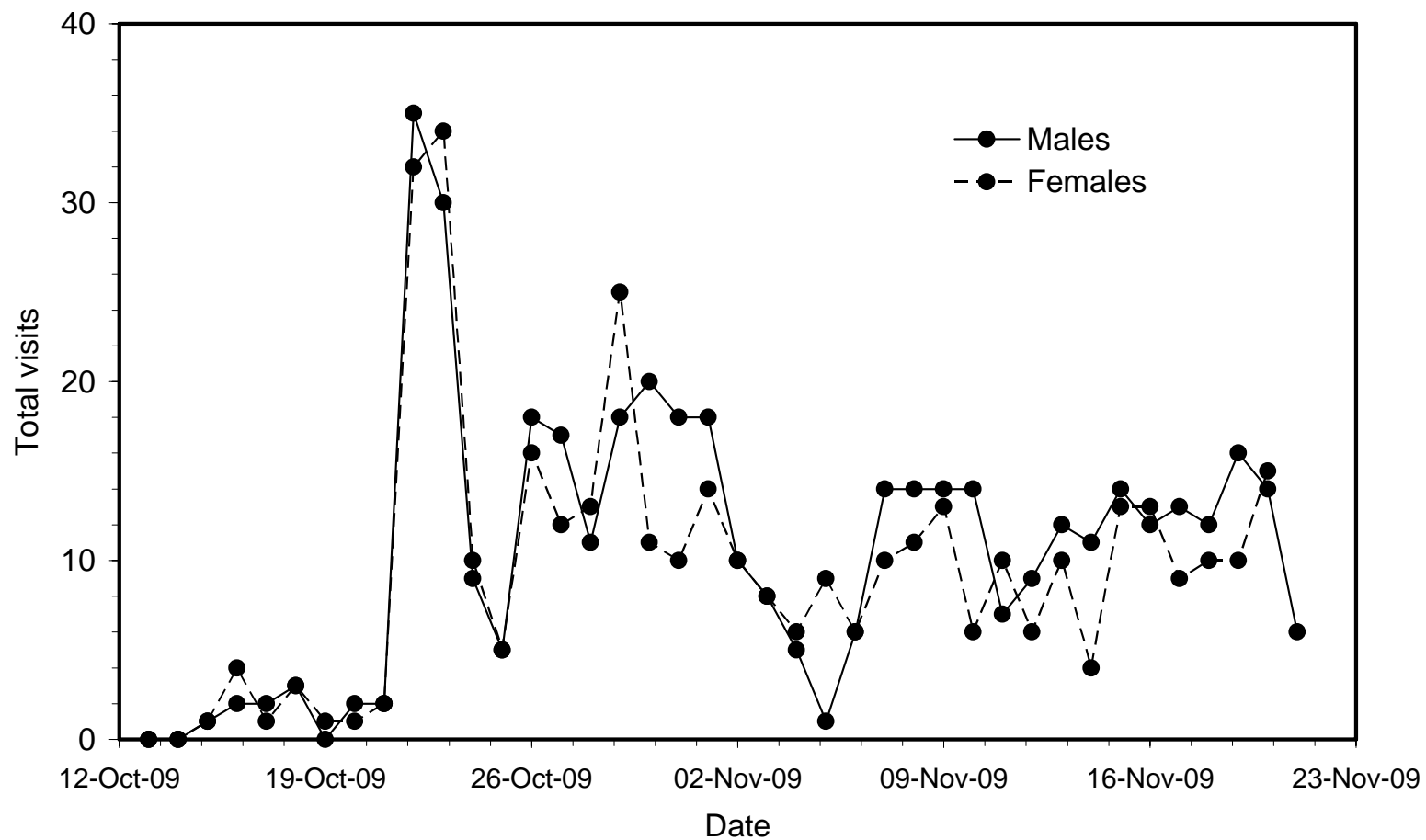
(306 males and 227 females in 4 reps over 39 days)



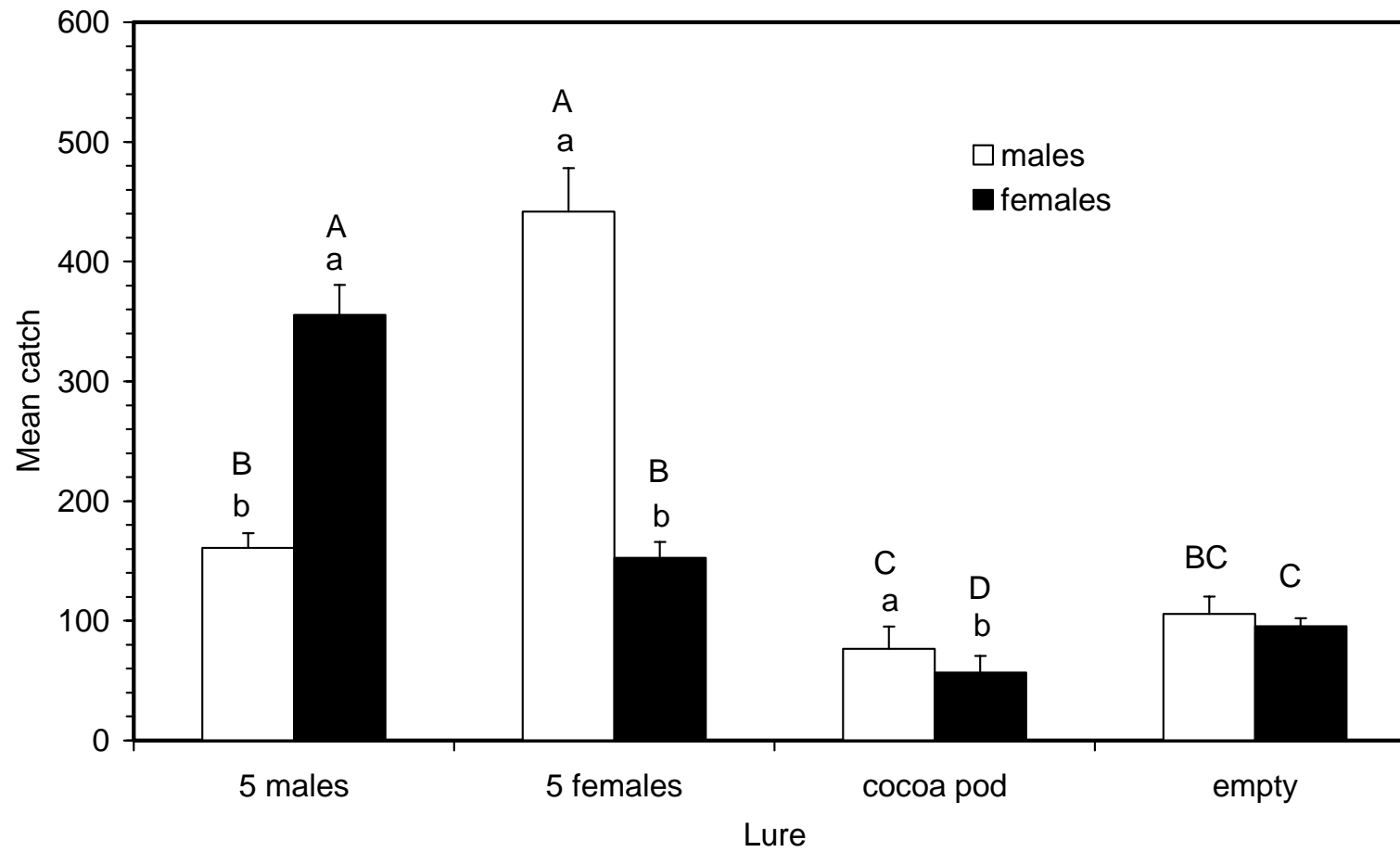
# *Helopeltis bradyi* FIELD EXPERIMENT

## ATTRACTION BY BLANK

(423 males and 382 females in 4 reps over 39 days)



# *Helopeltis bradyii* FIELD EXPERIMENT



# *Helopeltis bradyi* FIELD EXPERIMENT

## CONCLUSIONS

- Virgin females attract males
- Virgin males attract females
- Probably no same-sex attraction?

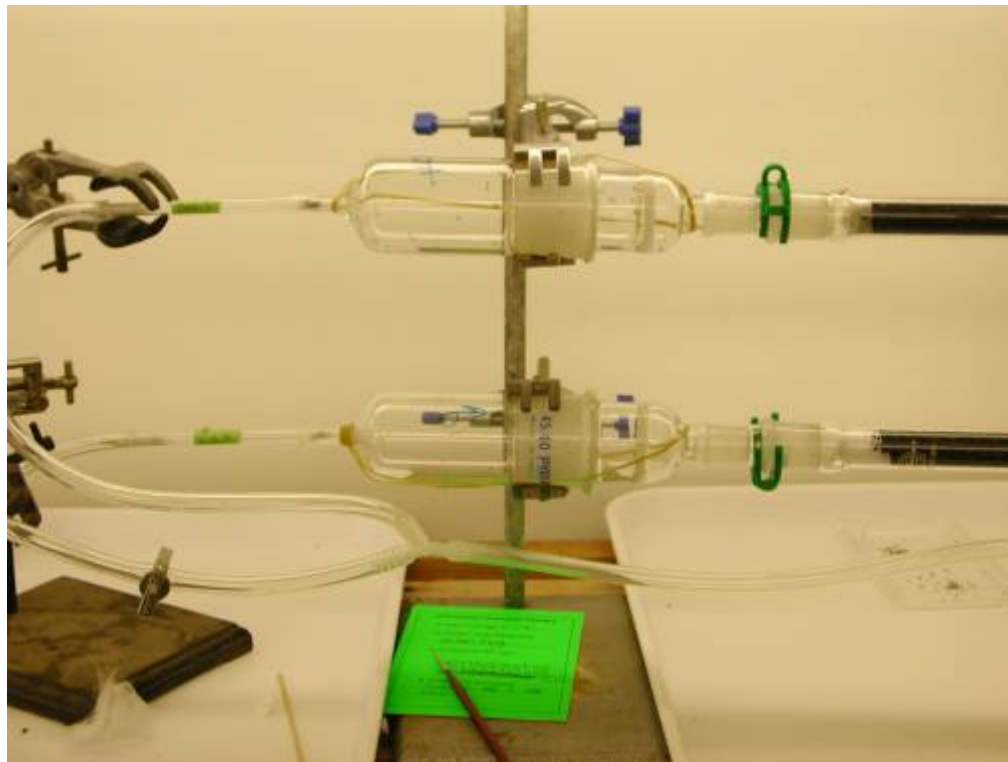




# *Helopeltis theivora* CHEMISTRY

## CHEMISTRY

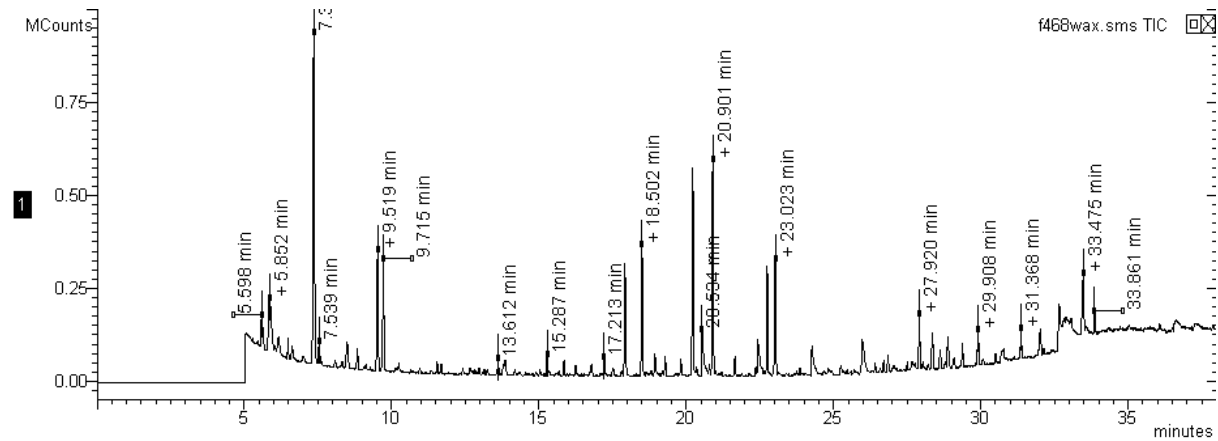
Volatiles collected from single and groups of *H. theivora*



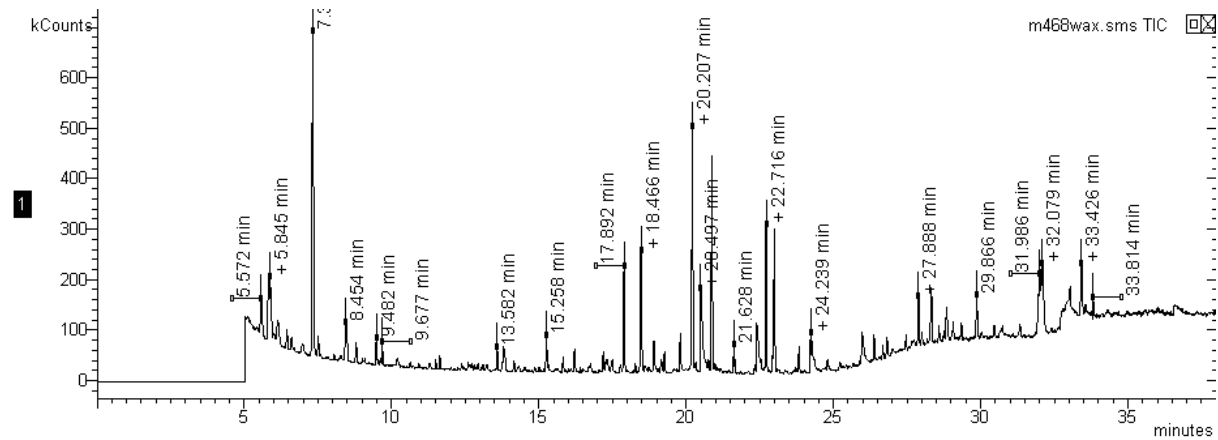
# *Helopeltis theivora* CHEMISTRY

## Analysed by GC-MS

female



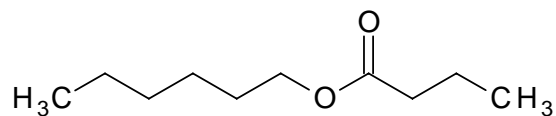
male



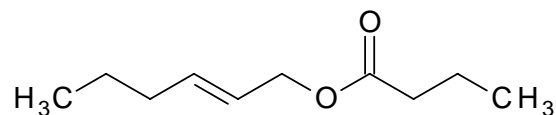
# *Helopeltis theivora* CHEMISTRY

## Traces of capsid-type compounds detected

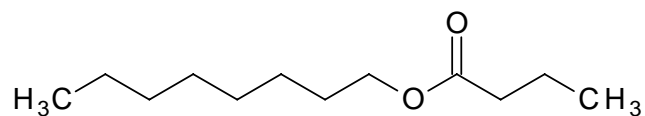
### MALES



Hexyl butyrate  
(HB)

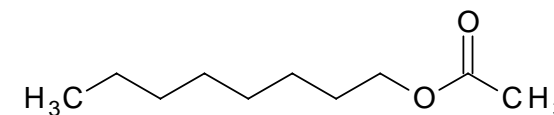
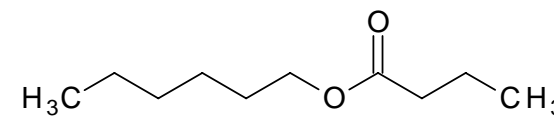


(E)-2-Hexenyl butyrate  
(E2HB)

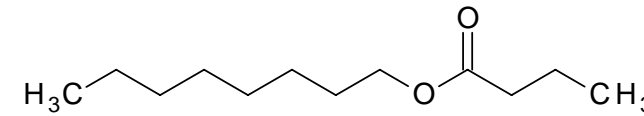


Octyl butyrate  
(OB)

### FEMALES



Octyl acetate  
(OA)



Octyl butyrate  
(OB)

# *Helopeltis theivora* CHEMISTRY

Field tests with synthetic compounds



# *Helopeltis theivora* CHEMISTRY

## Field tests with synthetic compounds (4 replicates)

Lure	Total Male Catch (4 reps)					Total
	16-May	17-May	18-May	19-May	20-May	
HB+E2HB+OB ("male mix")	0	0	0	0	0	0
HB+OA+OB ("female mix")	0	0	0	0	0	0
E2HB (male specific)	0	0	0	0	0	0
OA (female specific)	0	0	0	0	0	0
Virgin female	0	0	0	0	9	9
Unbaited	0	0	0	0	0	0

## FUTURE WORK ?

- EAG studies – requires live insects at NRI
- Repeat experiments with synthetic compounds
- Re-examine GC-MS results for other compounds
- Indian paper reporting (*Z*)-3-hexenyl acetate and (*E*)-2-hexenol as pheromone components

Sachin, J. P.; Selvasundaram, R.; Babu, A.; Muraleedharan, N. (2008). Behavioral and Electroantennographic Responses of the Tea Mosquito, *Helopeltis theivora*, to Female Sex Pheromones. *Environmental Entomology*, 37: 1416-1421

