Tropical insectivorous birds can smell trees calling for help

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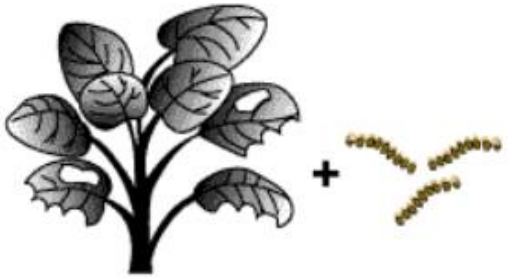
Herbivorous insect feeding on a plant trigger various chemical reactions that lead to secretion of volatile compounds from demaged plant cells



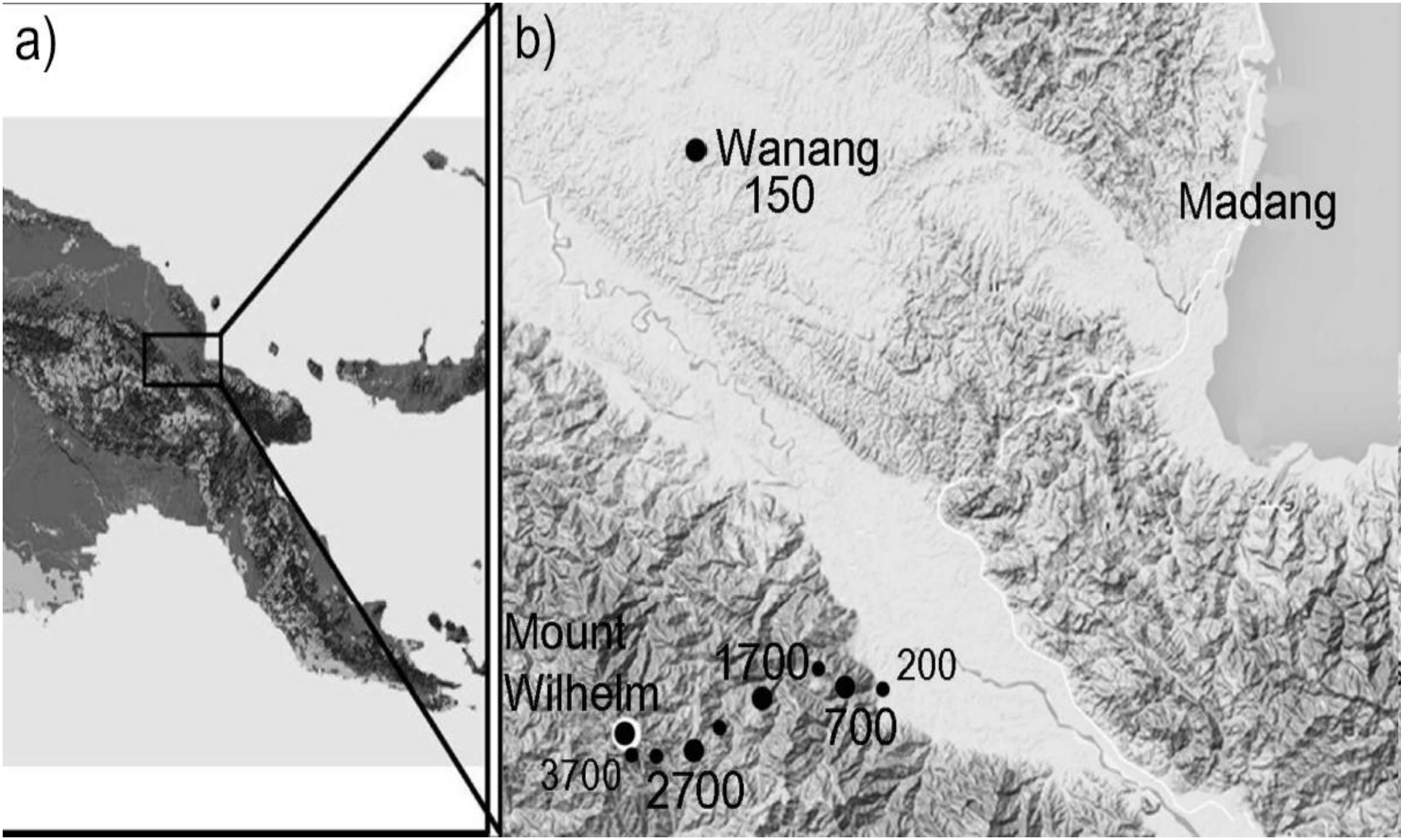
<u>Insect predators are able to use these volatile compounds as a clue when searching for prey</u>

In the last few years, the scientists are trying to simulate herbivorous damage experimentally in labs:

(A) MECHANICALLY

(B) CHEMICALLY

Our aim is to prove functioning of the simulated herbivory in practice in tropical areas, and compare the two methods


a)
b)
Wanang
150
Madang
Mount
Wilhelm
1700
200
700
3700
2700

Ficus hahliana in chemical experiment along elevational gradient

Ficus phaeosyceae in chemical preliminarly experiment in Wanang

24 saplings per treatment sprayed 4x
5 caterpillars per sapling

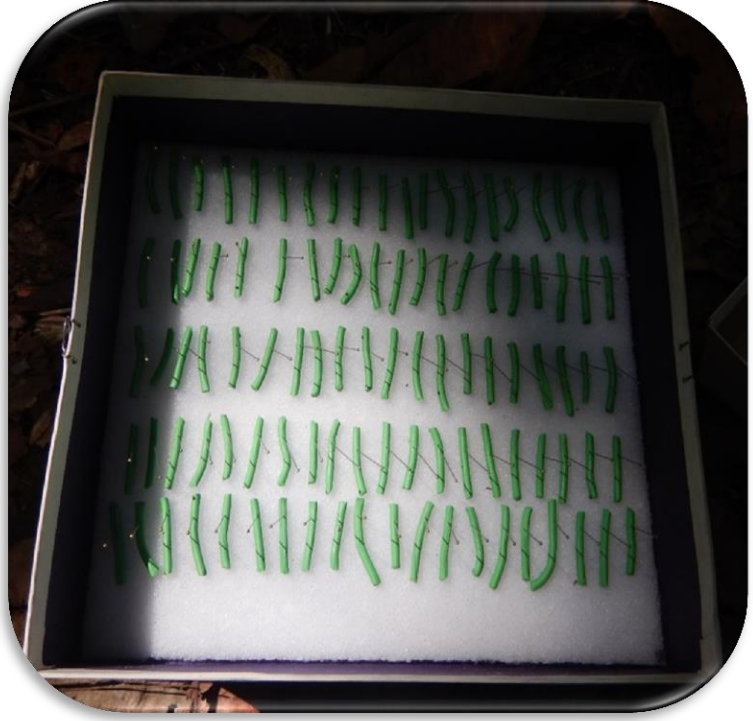
10 saplings per treatment sprayed 2x
10 caterpillars per sapling

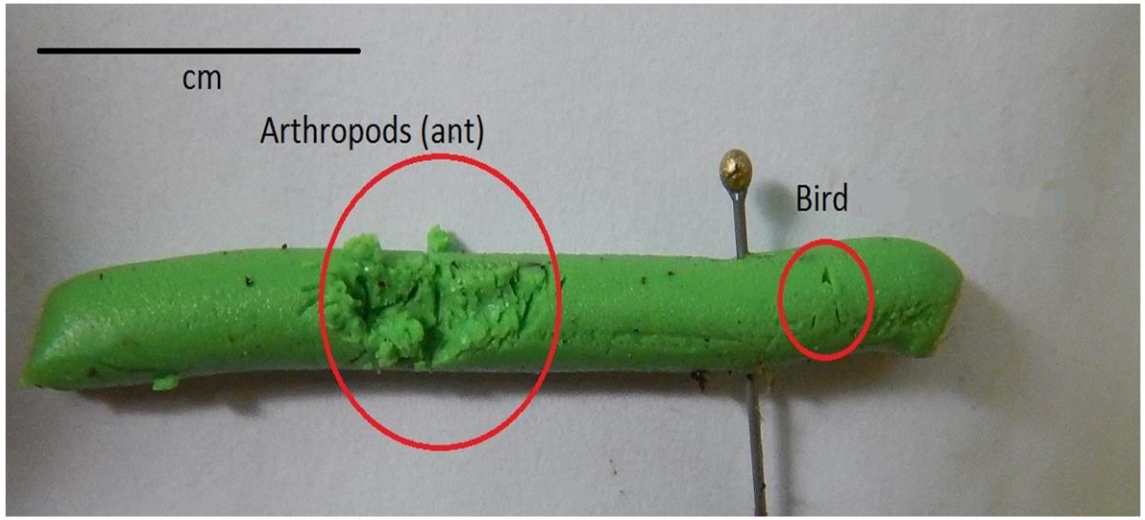
Tree species/Altitude m	200	700	1200	1700	2200	2700	3200	3700
Aglaia lepiorrhachis		X						
Chionanthus ramiflora		X	X	X				
Cryptocarya multipaniculata				X				
Dillenia papuana					X			
Ficus wassa	X							
Gnetum gnemon	X							
Nothofagus grandis					X			
Pittosporum ferruginea							X	
Platea excelsa					X			
Podocarpus sp.						X	X	X
Quintinia sp.						X	X	X
Sterculia schumanniana	X	X	X	X				

Trees involved in mechanical experiment along gradient

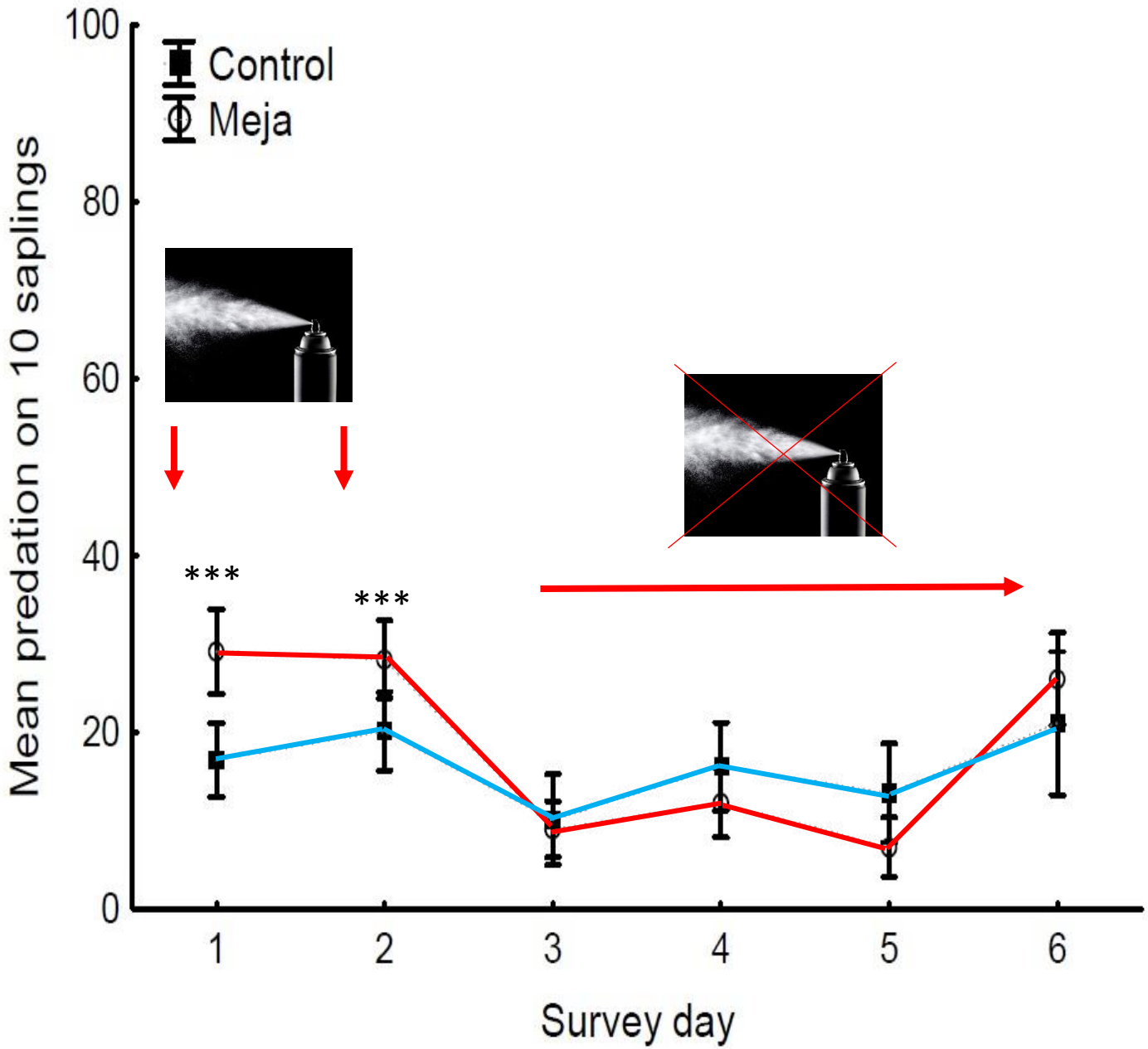
15 saplings per treatment/leaf area removed 5x/
10 caterpillars per sapling

Plasticine caterpillars resembled those of a common genus *Choreutis*




cm
Arthropods (ant)
Bird

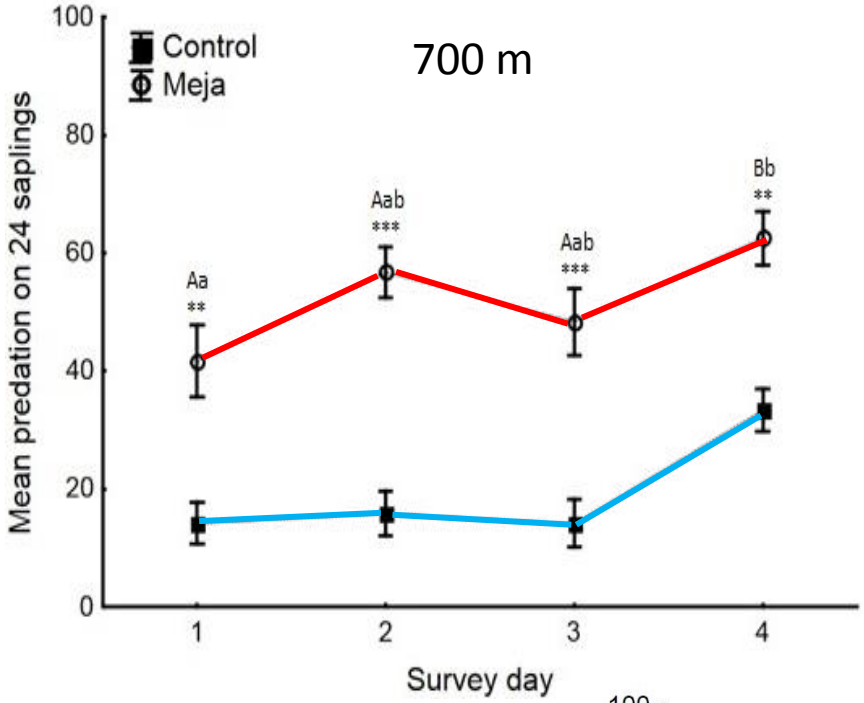
Preliminary experiments Wanang 150 m a. s. l.

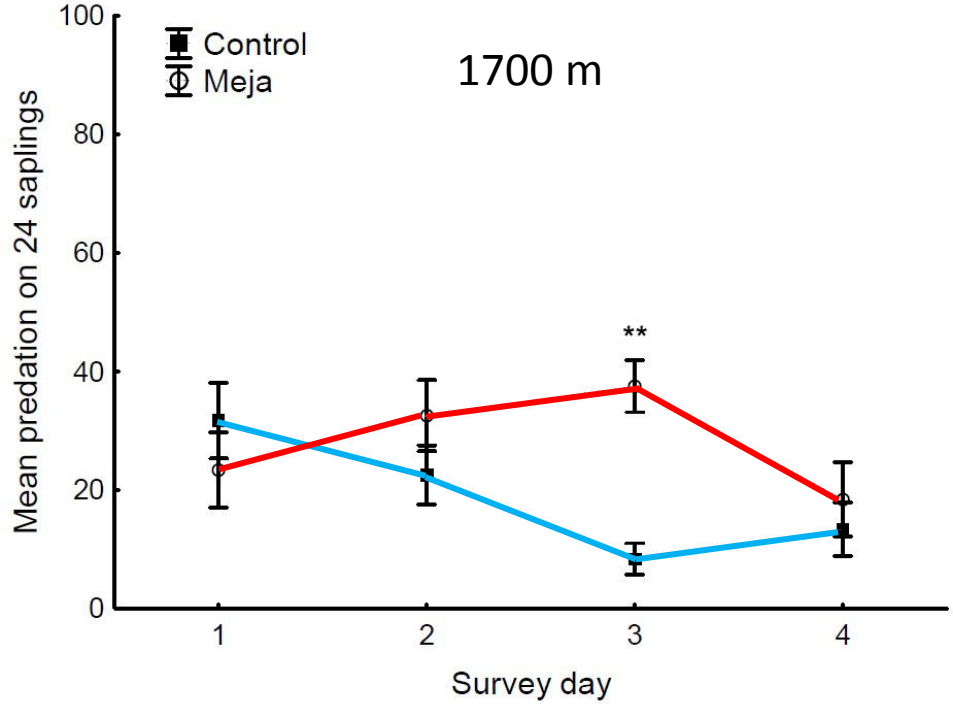


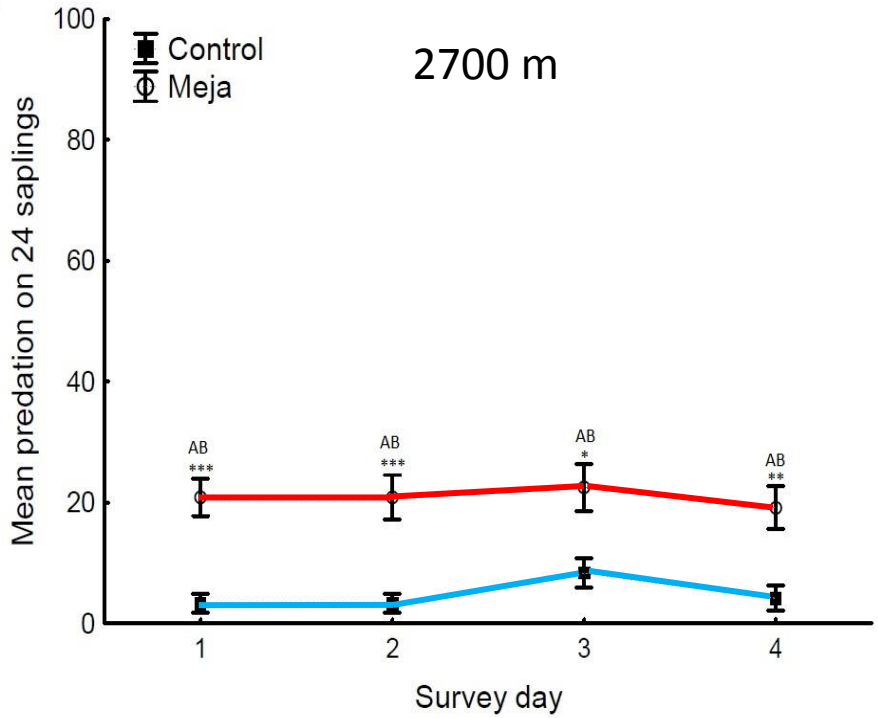
Chemicaly simulated herbivory attracted significantly more predators only up to ca. 24 hours after aplication of methyl-acetate jasmonic acid

MeJa
Control

*** $p \leq 0{,}001$



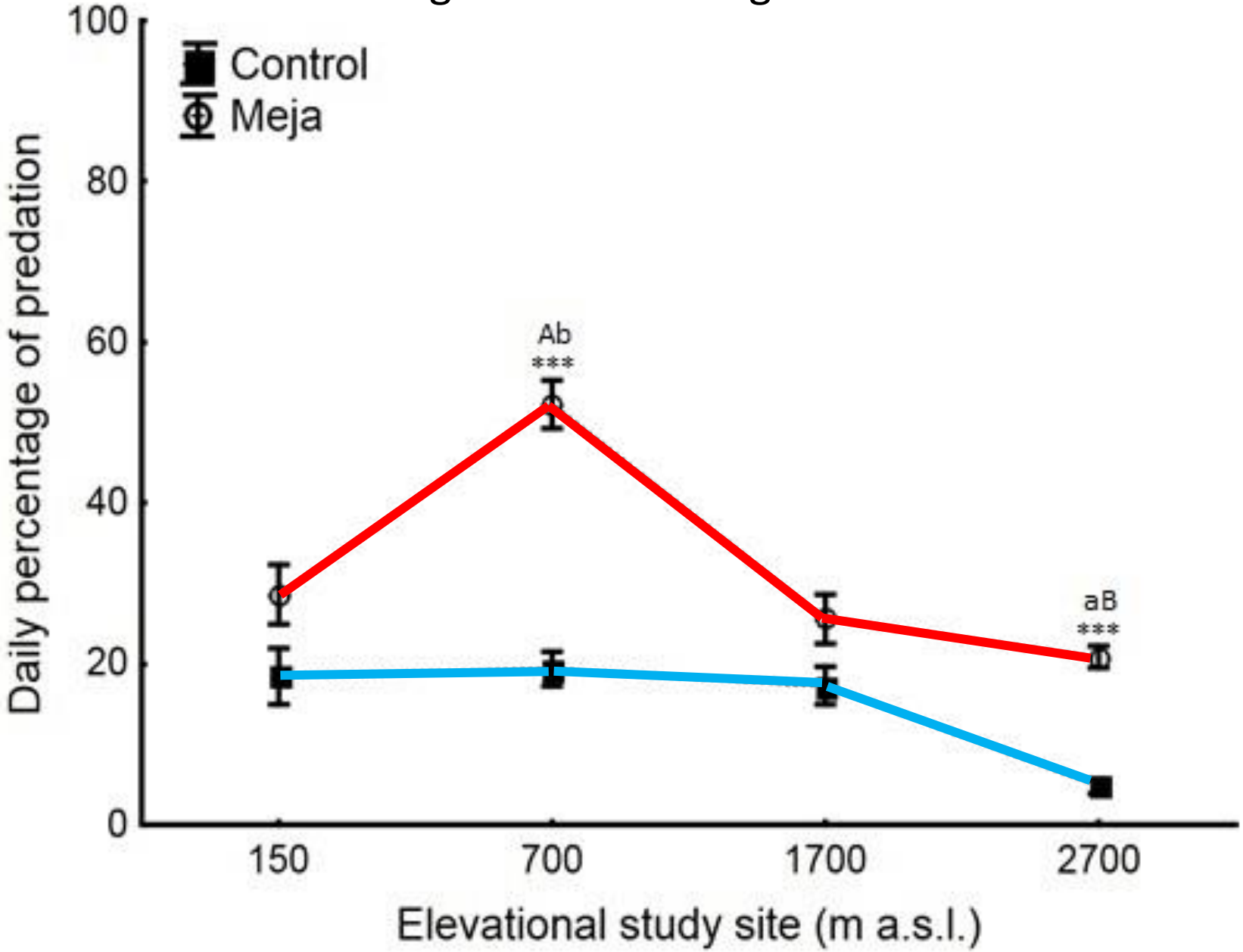


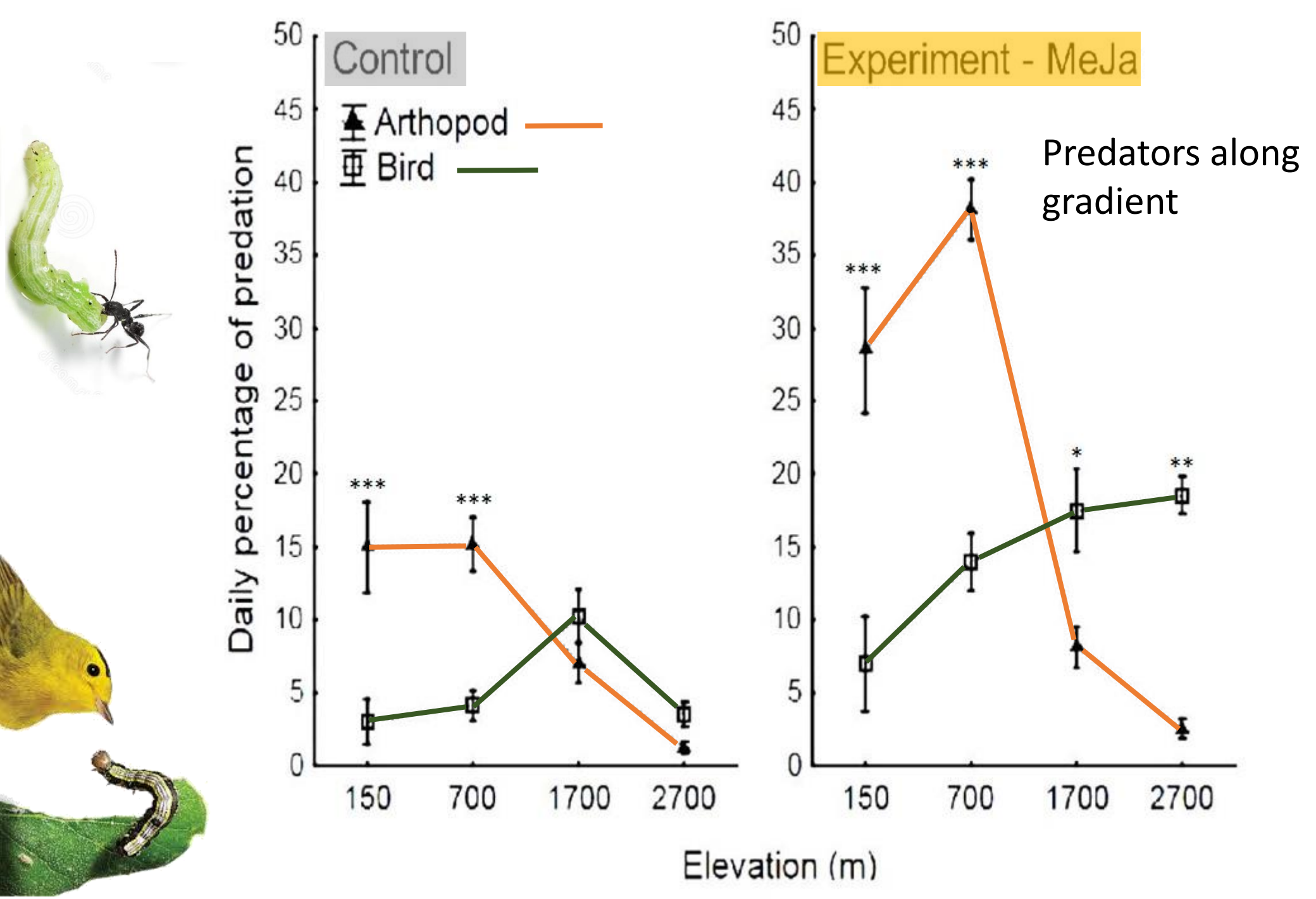


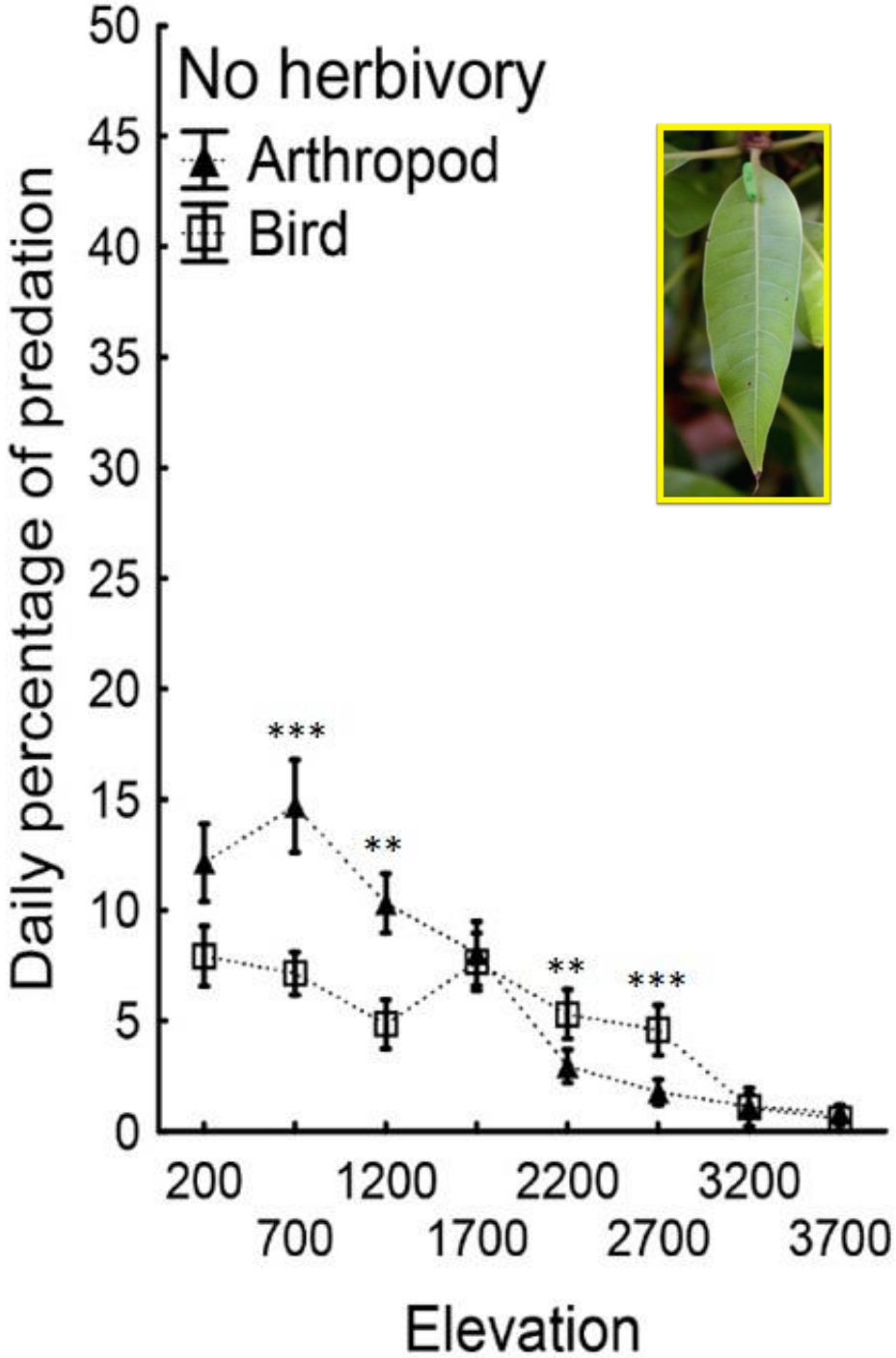
Chemical herbivory along an elevational gradient

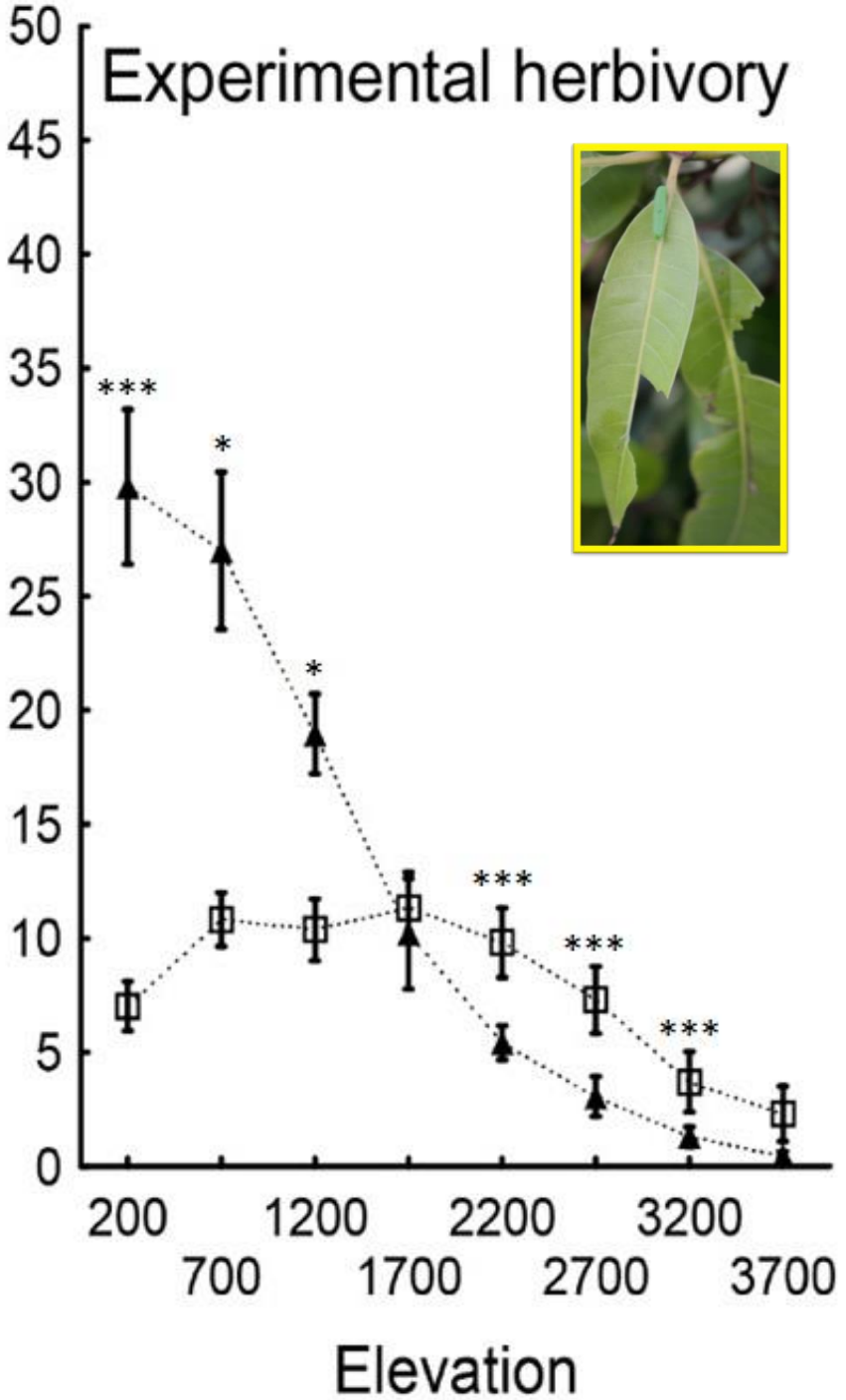
* $p \leq 0{,}05$
** $p \leq 0{,}01$
*** $p \leq 0{,}001$

Predation on dummy caterpillars in reaction to chemicaly simulated herbivory along an elevational gradient




Control
Experiment - MeJa
Arthopod
Bird
Predators along gradient
Daily percentage of predation
Elevation (m)
150
700
1700
2700
0
5
10
15
20
25
30
35
40
45
50
***
*
**


No herbivory
Arthropod
Bird
Daily percentage of predation
50
45
40
35
30
25
20
15
10
5
0
***
**
**
***
200
700
1200
1700
2200
2700
3200
3700
Elevation


Experimental herbivory
50
45
40
35
30
25
20
15
10
5
0
***
*
*
***
***
***
200
700
1200
1700
2200
2700
3200
3700
Elevation

Summary

- Experimentaly simulated herbivory **succesfully attracts** predators of herbivorous insect.

- Mechanically and chemically simulated herbivory brings almost equally strong response.

- Dummy caterpillars exposed on treated trees are twice more likely predated than dummy caterpillars exposed on control treeswithout herbivorous damage.

- Herbivorous insects in tropical lowland forest are more likely predated by other insect predators, while they have relatively higher chance to be predated by birds at higher elevations (above ca. 1700 m a. s. l.).

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