



The invasion of brown marmorated stink bug in Europe

Tim Haye¹, Denise Wyniger², Tara Gariepy³

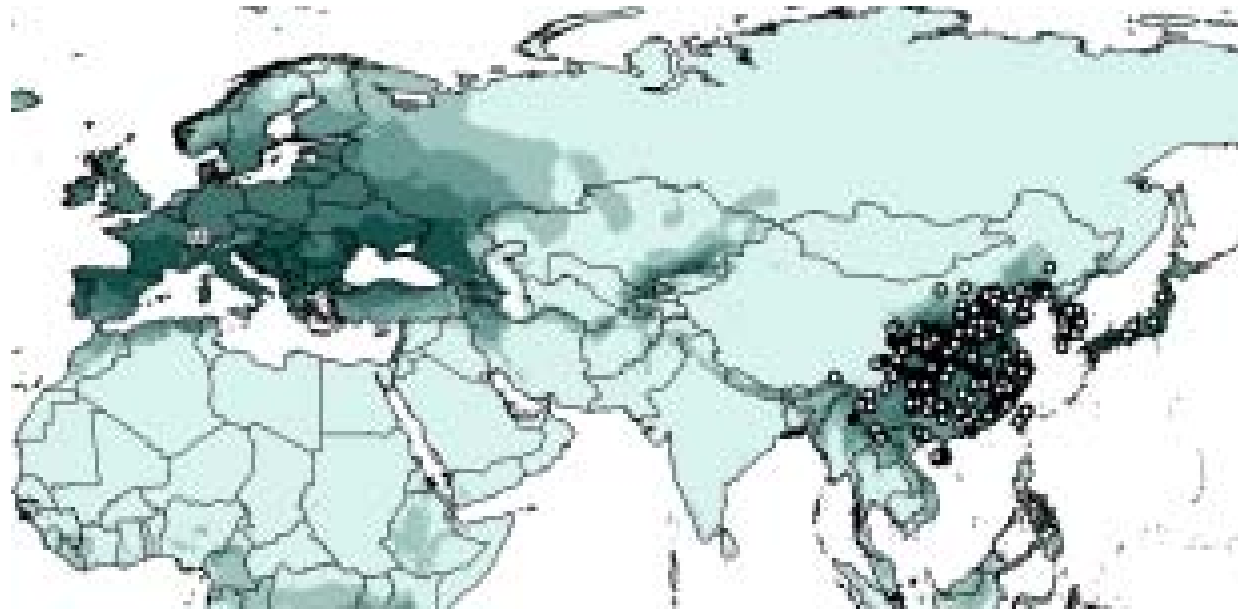
¹CABI Switzerland, ²Natural History Museum Basel, ³AAFC London

www.cabi.org

KNOWLEDGE FOR LIFE

Potential area of invasion

- Southern and central Europe are most threatened by BMSB



First records in Europe

- Officially reported in 2008, based on material collected in Zurich (Switzerland) in 2007 (Wermelinger et al. 2008)
- Older record from Lichtenstein (2004) (Arnold 2009)
- Hobby photographer send us a photo taken in Zürich-Seefeld on May 15, 2004



First records in Europe

- Original introduction probably much earlier in the 1990s



- first not recognized
- native *Raphigaster nebulosa* looks similar and has a similar ecology

How did it get into Europe?



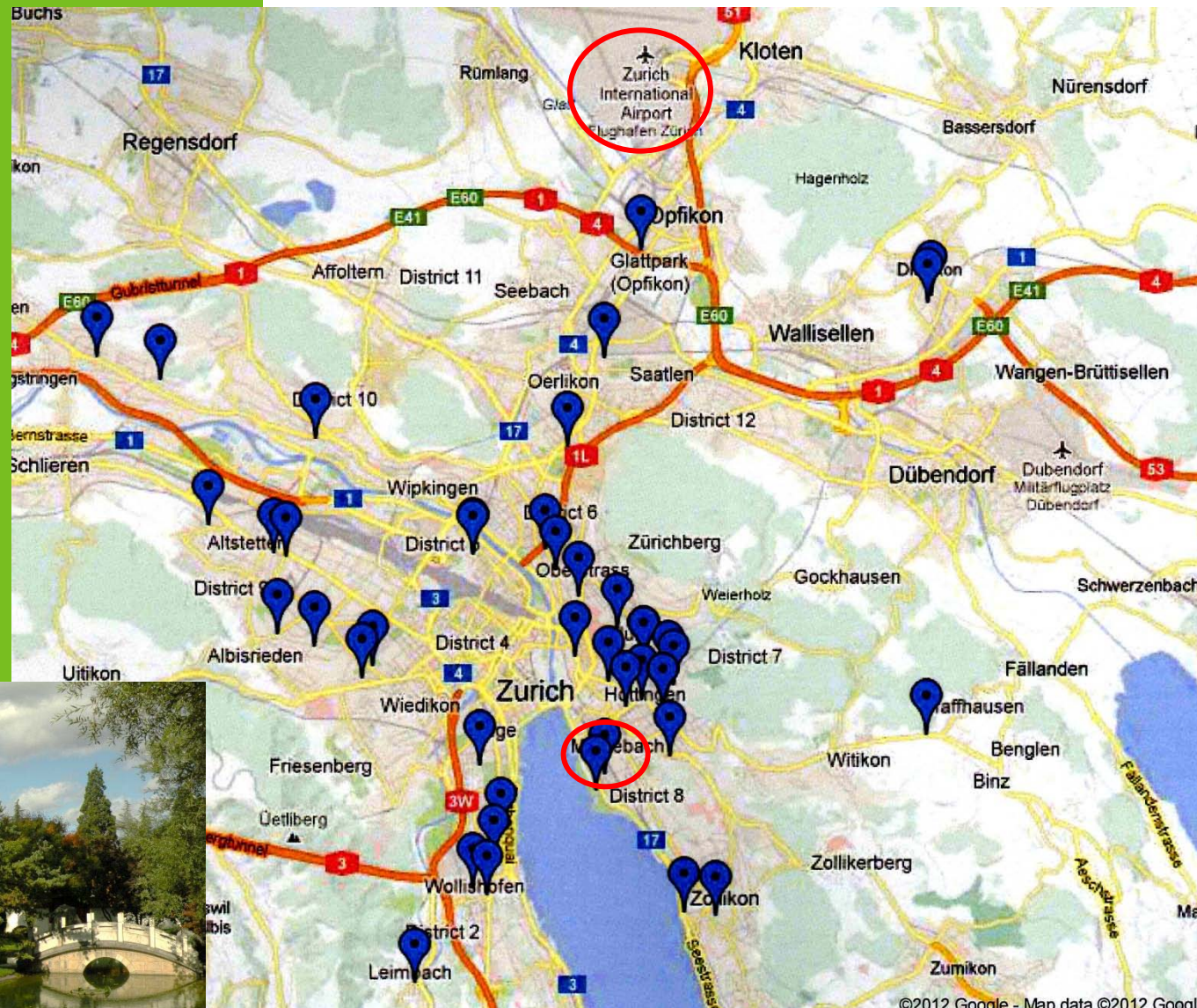
Two possibilities:

- with shipments from Asia
- with shipments from the US (one case reported from Germany)

Coincidence or not?

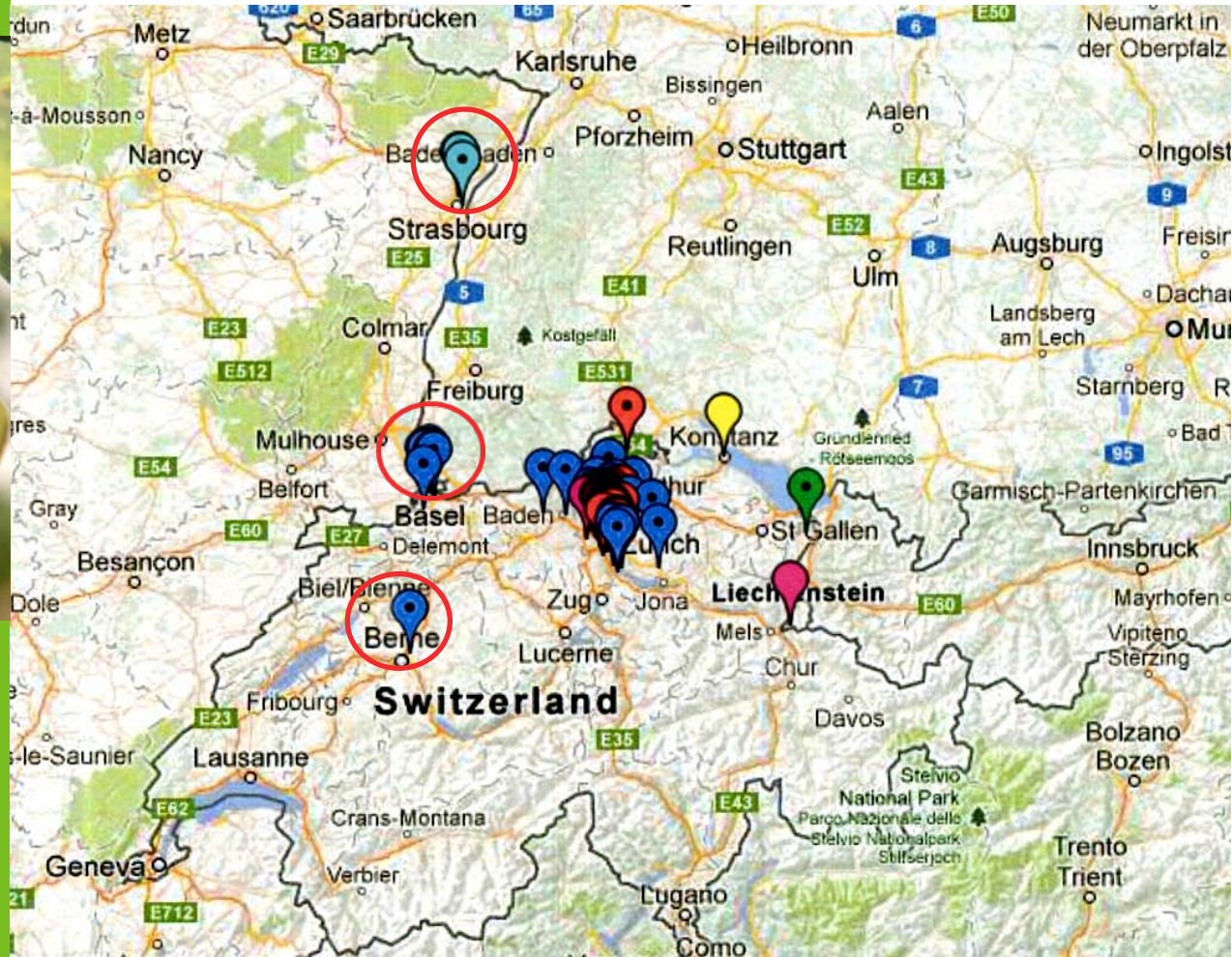
- in 1993 a Chinese garden was built at the lake of Zurich with plants and material imported from China
- in 1998 roof tiles of the temple were replaced with original material from China
- Swiss populations genetically not identical with US populations

Invasion of BMSB in Europe



Distribution in 2012/13

www.halyomorphahalys.com



- Large population now also present in Bern and Basel
- Single record from Germany (Heckmann 2012)
- First breeding populations outside Switzerland found in Strassbourg (France) in 2012/2013 (Callot et al. 2013)

Nuisance problem in the Canton Zurich

- Houses with balconies directed to the southwest, light painted walls
- Exposed houses on top of mountains
- Houses with plants growing up the walls (ivy, Japanese creeper)



Damage



- Although present since 2004 (or longer) first damage only reported in 2012 from pepper crops in the Swiss Canton Aargau
- Private gardeners reported damage on cherries, almonds, apricots, nectarines etc.
- Not considered as economically important pest ...yet



Host plants



In Switzerland:

Prunus avium (Rosaceae) – sweet cherry

Prunus armeniaca (Rosaceae)

Prunus persica var. *nucipersica* (Rosaceae)

Prunus persica (Rosaceae)

Prunus dulcis (Rosaceae)

Sorbus aucuparia (Rosaceae) - ash

Prunus spinosa (Rosaceae)

Rubus idaeus (Rosaceae)

Rubus fruticosus (Rosaceae)

Amelanchier lamarckii (Rosaceae)

Solanum melongena (Solanaceae)

Capsicum annuum (Solanaceae)

Campsis grandiflora (Bignoniaceae) – Trumpet creeper

Buddleja davidii (Scrophulariaceae) - Butterflybush

Decaisnea fargesii (Lardizabalaceae)

Asparagus falcatus (Asparagaceae)

Lupinus sp. (Fabaceae)

Vicia sp. (Fabaceae)

***Parthenocissus* sp.** (Vitaceae) Virginia creeper

Aralia elata (Araliaceae)

Carpinus betulus (Betulaceae) - hornbeam

Acer pseudoplatanus (Sapindaceae)

Laurus nobilis (Lauraceae)

Hibiscus sp. (Malvaceae)

Tropaeolum majus (Tropaeolaceae)

Stewartia pseudocamellia (Theaceae)

- 26 host plants recorded

Questions

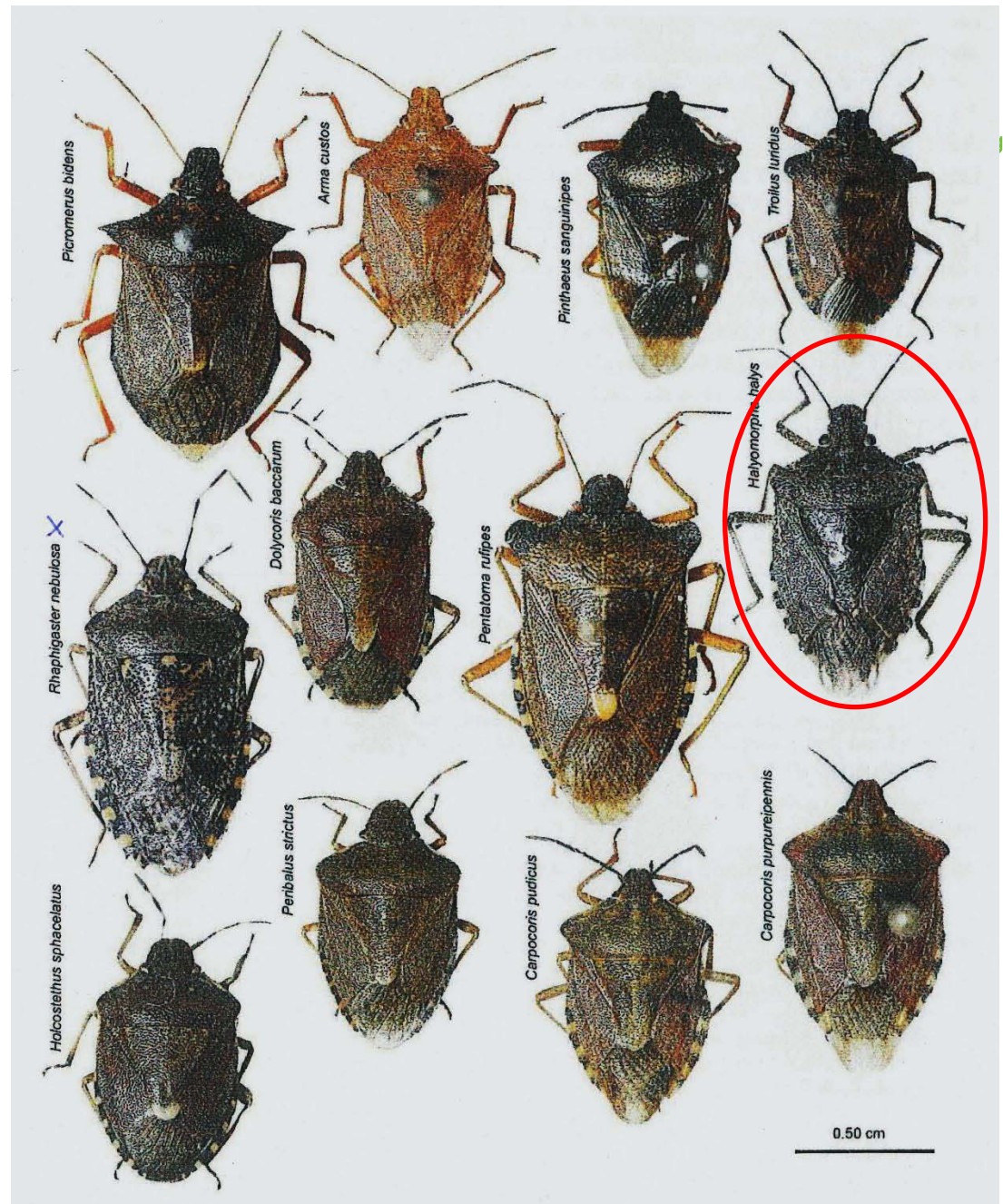


Why is *H. halys* only slowly spreading in Europe?



Could native European parasitoids be the reason?

Pentatomid species in Europe



Key to European species:
Wyniger & Kment 2010
(Mitt. Schweiz. Entomol.
Gesell. 83)

Egg exposure of BMSB eggs in Switzerland



- exposure of 62 egg masses (=1,251 eggs) in Switzerland
- no parasitism observed!

Which species to test?

- More than 11,000 eggs of 7 Pentatomid species were exposed in the CABI Switzerland institute garden



Host species	Month	# eggs exposed	eggs lost	eggs recollected	parasitized eggs	% parasitism
<i>Dolycoris baccarum</i>	May	820	589	231	0	0
	June	843	571	272	22	8.09
	July	207	162	45	42	93.33
<i>Carpocoris purpureipennis</i>	May	334	260	74	0	0
	June	477	214	263	0	0
	July	110	89	21	0	0
<i>Piezodorus lituratus</i>	May	485	210	275	0	0
	June	508	282	226	0	0
	July	143	127	16	0	0
<i>Carpocoris fuscispinus</i>	May	2152	1846	306	14	4.58
	June	4047	2001	2046	128	6.26
	July	358	160	198	91	45.96
<i>Eurydema ornatum</i>	May	238	115	123	0	0
	June	501	155	346	0	0
	July	96	20	76	0	0
<i>Palomena prasina</i>	May	206	125	81	0	0
	June	269	144	125	46	36.8
	July	41	15	26	6	23.08
<i>Graphosoma lineatum</i>	May	0	0	0	0	0
	June	540	363	177	9	5.08
	July	83	48	35	2	5.71

- Parasitism highest in July, three parasitoids reared

Host range of European egg parasitoids



***Telenomus chloropus* (Thomson)**

Aelia acuminata
Aelia furcula
Aelia rostrata
Carpocoris fuscispinus
Carpocoris pudicus
Chlorochroa pinicola
Dolycoris baccarum
Eurydema oleracea
Eurygaster austriacus
Eurygaster integriceps
Eurygaster maurus
Eysarcoris ventralis
Graphosoma lineatum
Holcogaster fibulata
Nezara viridula
Palomena prasina
Palomena viridissima
Perillus bioculatus
Piezodorus hybneri
Scotinophara coarctata
Scotinophara lurida

***Trissolcus semistriatus* (Nees)**

Aelia acuminata
Aelia cognata
Aelia furcula
Aelia germari
Aelia rostrata
Aelia virgata
Carpocoris pudicus
Chlorochroa pinicola
Dolycoris baccarum
Eurydema ornata
Eurydema ventralis
Eurygaster austriacus
Eurygaster integriceps
Eurygaster maurus
Graphosoma semipunctatum
Holcostethus strictus vernalis
Odontotarsus impictus
Palomena prasina
Troilus luridus
Ventocoris fischeri

***Trissolcus scutellaris* (Thomson)**

Aelia acuminata
Dolycoris baccarum
Eurygaster integriceps

Laboratory no-choice tests with European parasitoids

- *Trissolcus semistriatus*



- *Telenomus chloropus*



24 h exposure of individual females to single egg masses of

a) *Halyomorpha halys*

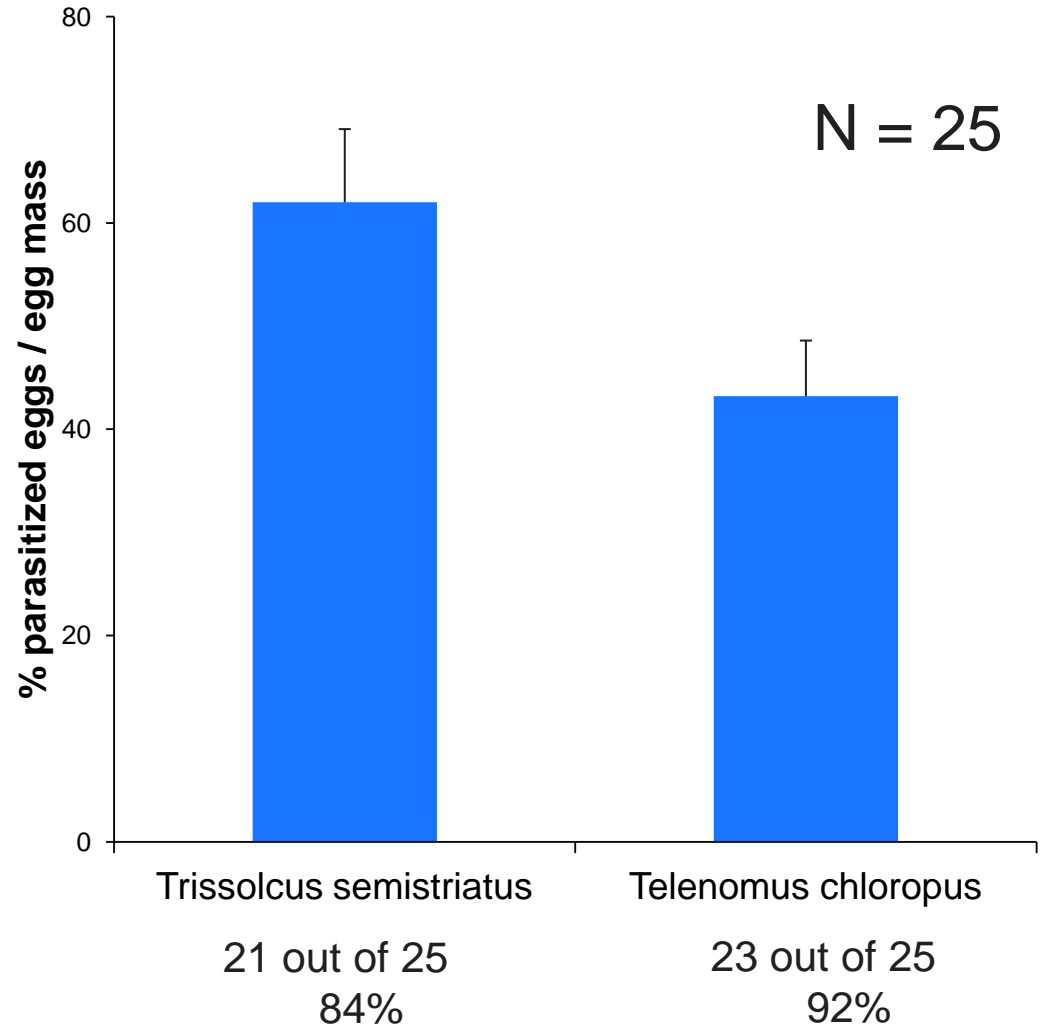
b) *Dolycoris baccarum*
(control for European species)

Results:
No choice tests
with native
European egg
parasitoids



Control: eggs of
Dolycoris baccarum

Parasitism in Controls (*D. baccarum*)



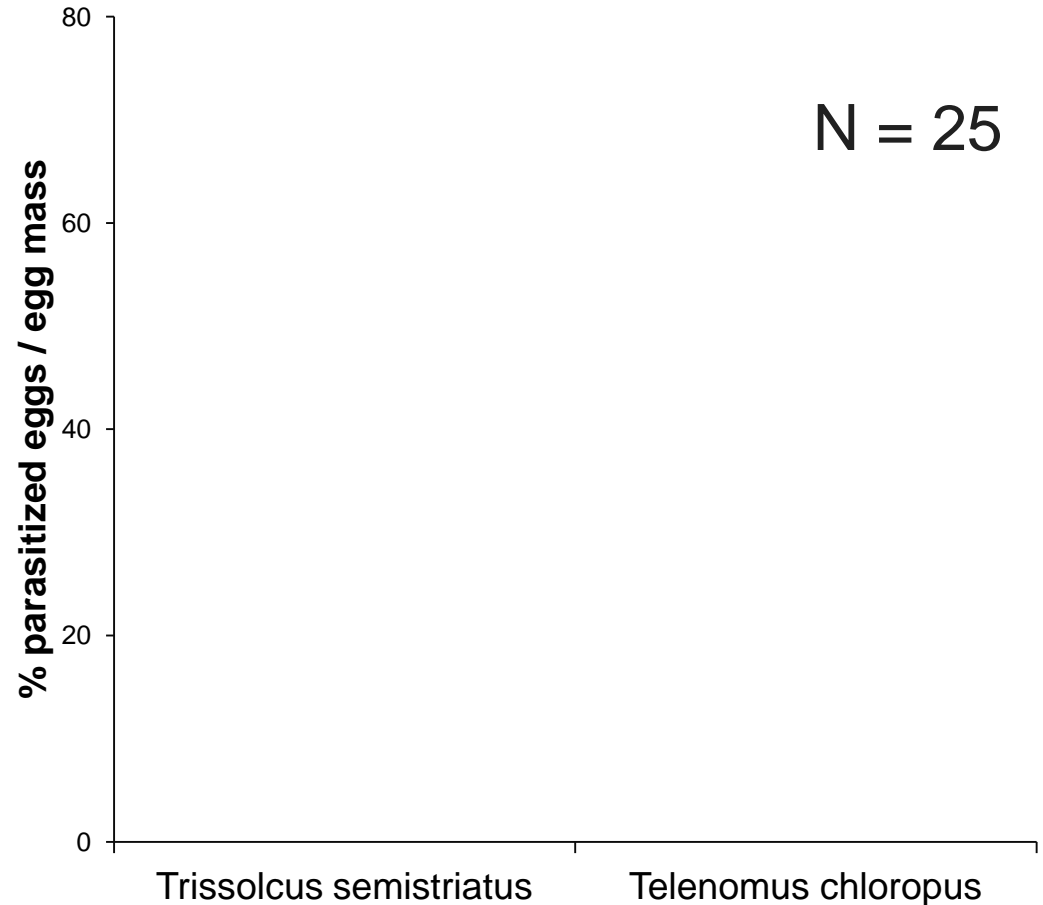
Results:
No choice tests
with native
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Parasitism of Target (BMSB)



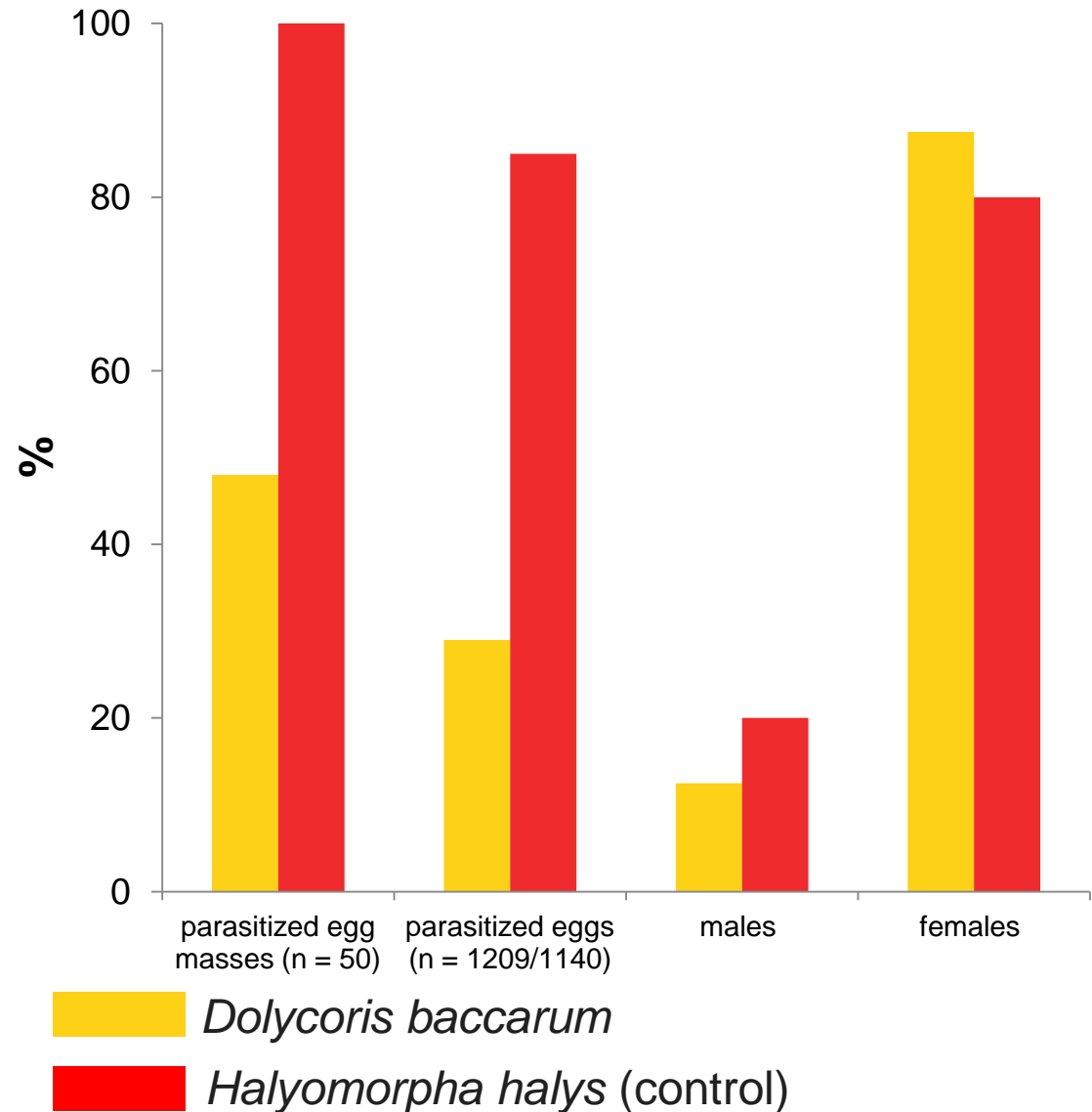
N = 25



0 out of 25
0%

No choice tests with *Trissolcus japonicus* in China

- *Dolycoris baccarum* also present in China!



What is the ecological host range of *Trissolcus japonicus* in China?

- collection of non-target egg masses in Beijing and Hebei Province
- in orchards and natural sites



Collection of BMSB and non-target egg masses in China



Species	<i>H. halys</i>	<i>Dolycoris baccarum</i>
# egg masses collected	47	18
overall parasitism (%)	83	28
<i>Trissolcus japonicus</i>	70	19
<i>Anastatus sp.</i>	11	-
<i>Trissolcus flavipes</i>	2	-
<i>Telenomus sp.</i>	-	6
<i>Ooencyrtus sp.</i>	-	3

Collection of
BMSB and non-
target egg
masses in China
in 2013



Plautia stali

H. halys

Future work



- Ecological host range studies in China in 2013/2014
- Testing of additional native European egg parasitoids
- Exposure of *H. halys* egg masses in Europe will be continued
- Phenology of BMSB in Europe



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