Semiochemicals in the integrated management of soft fruits: overview of research results of our team

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Foto: Nagy Z. L.

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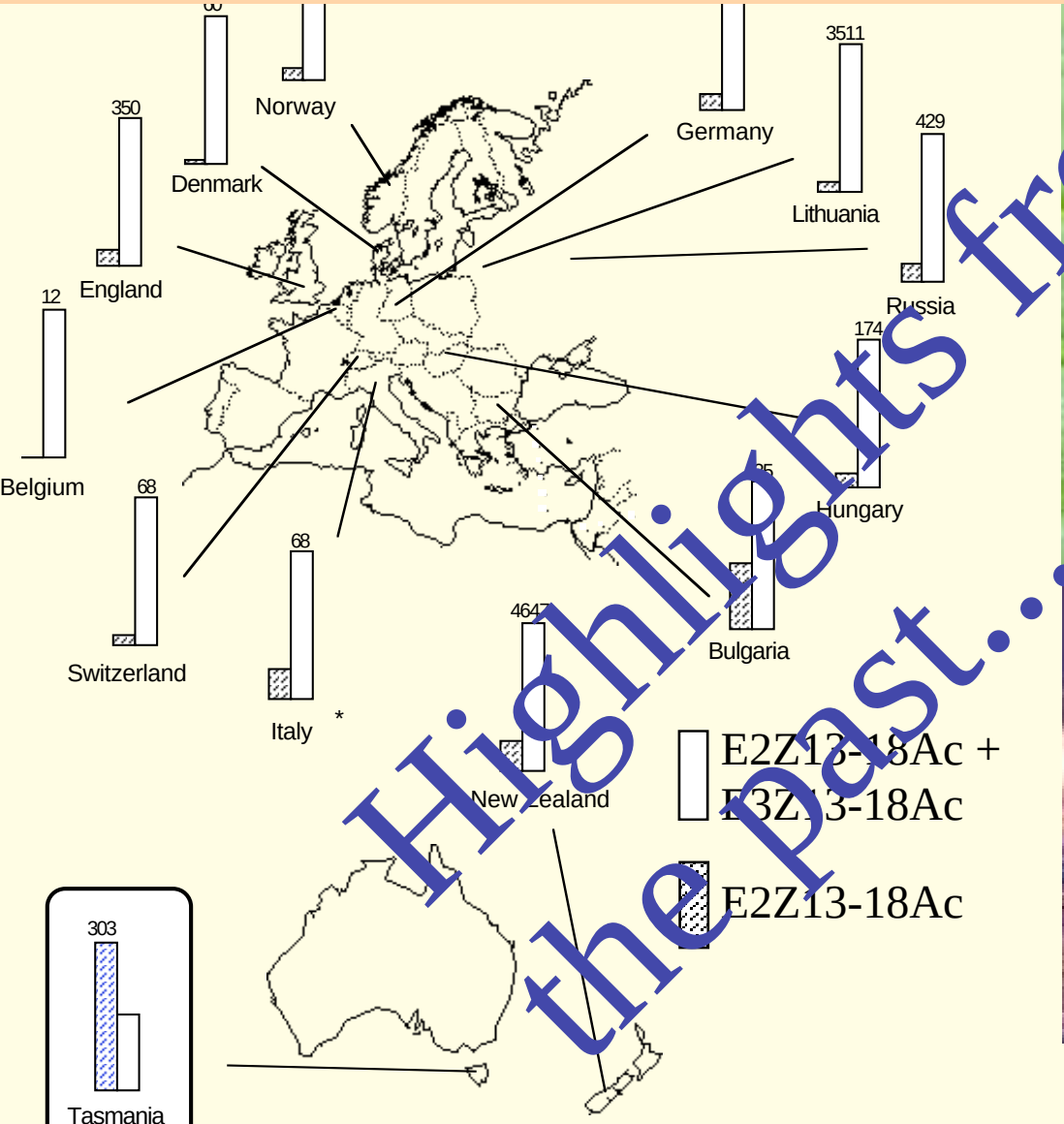
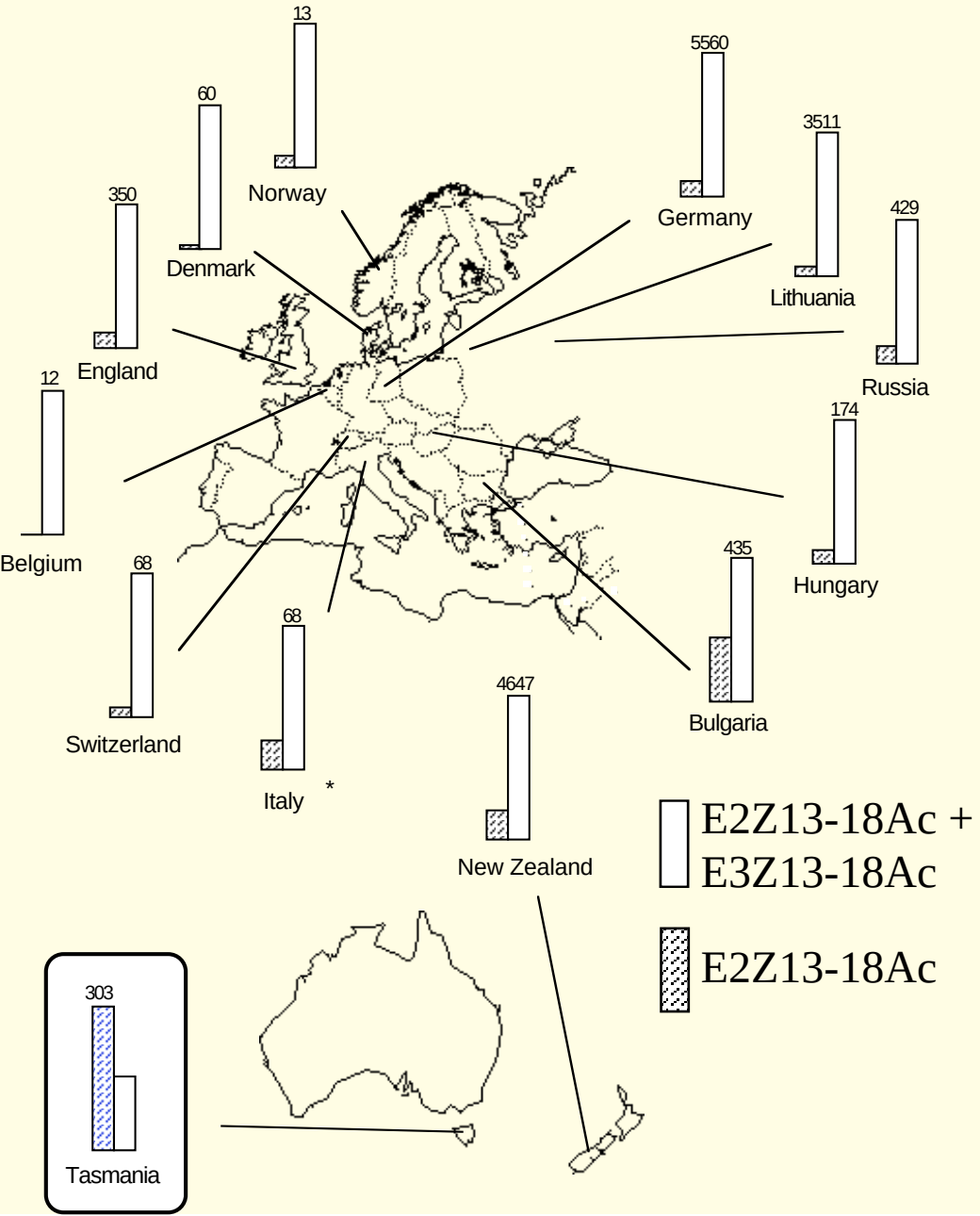
Doing research on pheromones and other semiochemicals, the Pheromone Group of PPI HAS has achieved some interesting results in the research of pheromones of some selected soft fruit pests in the past.

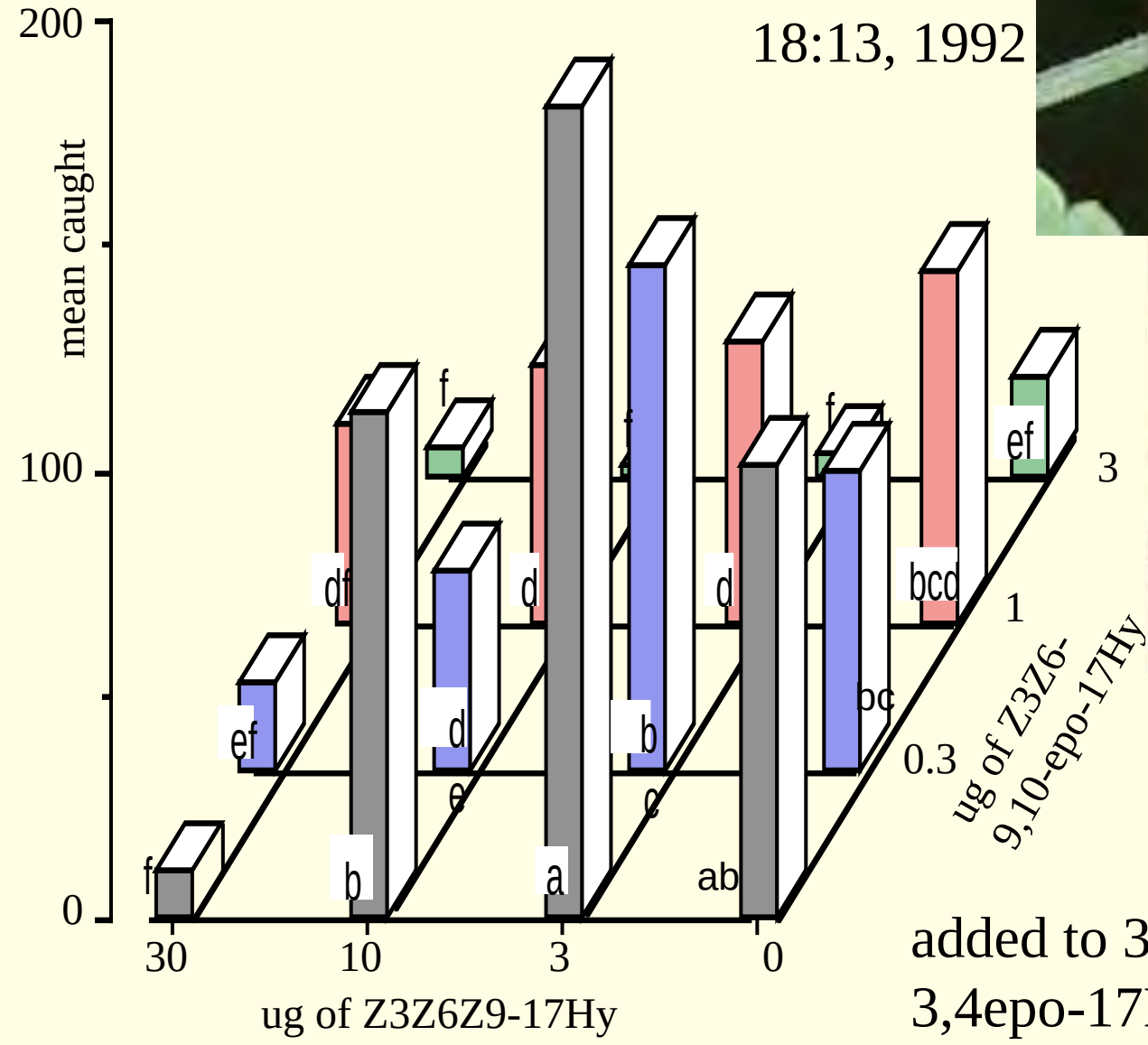


Highlights from the past...

Synanthedon tipuliformis: Szöcs G. Miller L.A. Thomas W. Vickers R.A. Rothschild G.H.L. Schwarz M. Tóth M. J. Chem. Ecol. 16:1289, 1990



Abraxas grossulariata: Tóth M. Buser H.R. Guerin P.M. Arn H. Schmidt F. Francke W. Szöcs G. J. Chem. Ecol. 18:13, 1992



added to 30 ug of Z6Z9-3,4epo-17Hy

But this time I shall talk about something different....

Cetoniin scarabs: in some localities they can swarm in very large numbers and their damage is not easy to avert.

Epicometis (Tropinota) hirta is one of the most abundant pest species of the subfamily.

Apart from different fruit trees, *E. hirta* can be a devastating pest of strawberries and other berries as well, damaging the flowers,

or even ripening fruits, causing yield loss and malformed fruits which cannot be marketed.

Foto:I. Sivcev

An attractant baited trap could be a useful tool in detection, monitoring, and even perhaps in mass trapping (for direct control) of the pest.

But, how to make one???

(*E. hirta* may not use a sex pheromone)

Lets look for floral attractants instead!!!

Fotó: Nagy Z. L.

To select candidate attractants, EAG screenings of synthetics could be helpful.

Electroanennograms (EAG):

Airstream into which stimulus is given

insect antenna

glass capillary electrodes

EAG response evoked by a stimulus

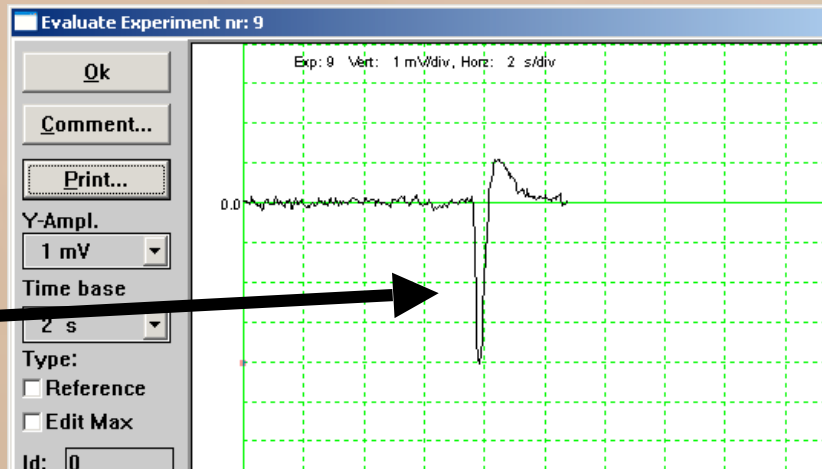


Foto:I. Moénár B.

With scarabs, special antennnal preparation is necessary.

Electroanennograms (EAG):

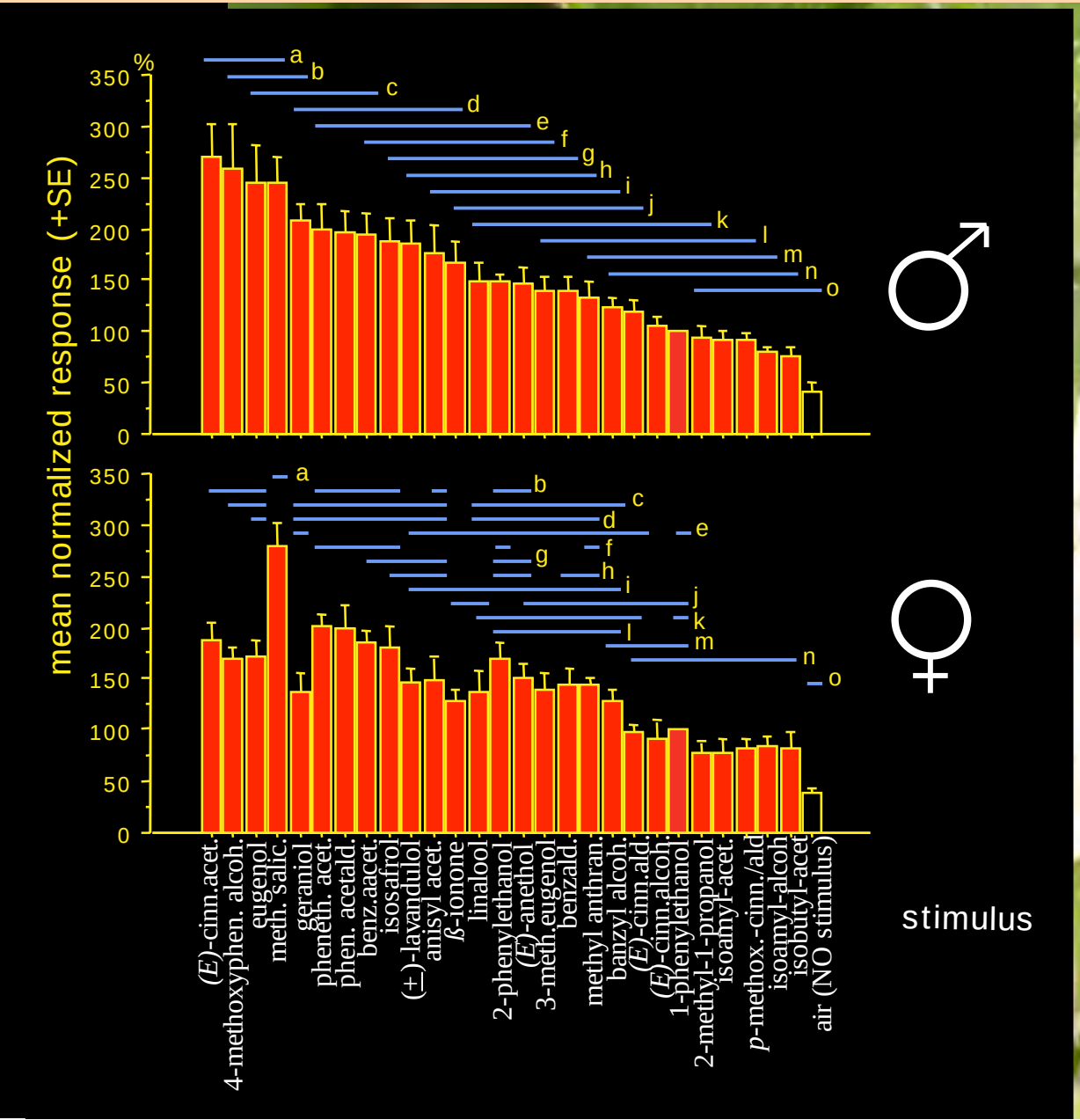
Airstream into which stimulus is given

electrodes

EAG response evoked by a stimulus

Foto:I. Moénár B.

EAG response spectra to common floral compounds may allow to restrict compounds to be field tested to a manageable number.

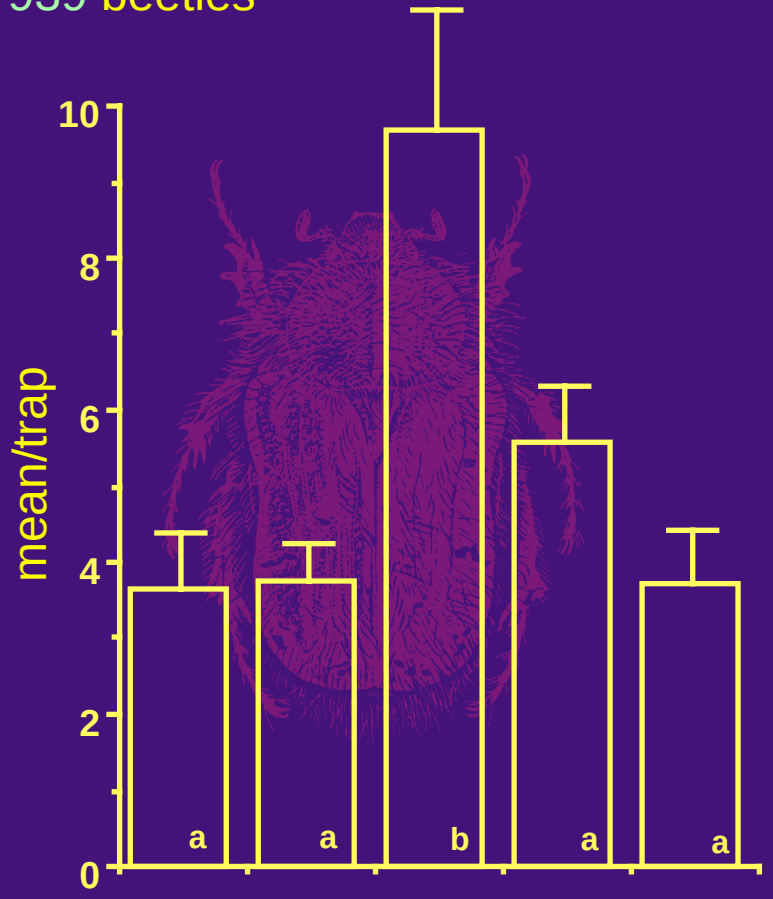


Having screened a number of compounds in field trapping tests, we established that *E. hirta* was attracted to a mixture of (*E*)-cinnamyl alcohol and (*E*)-anethol.

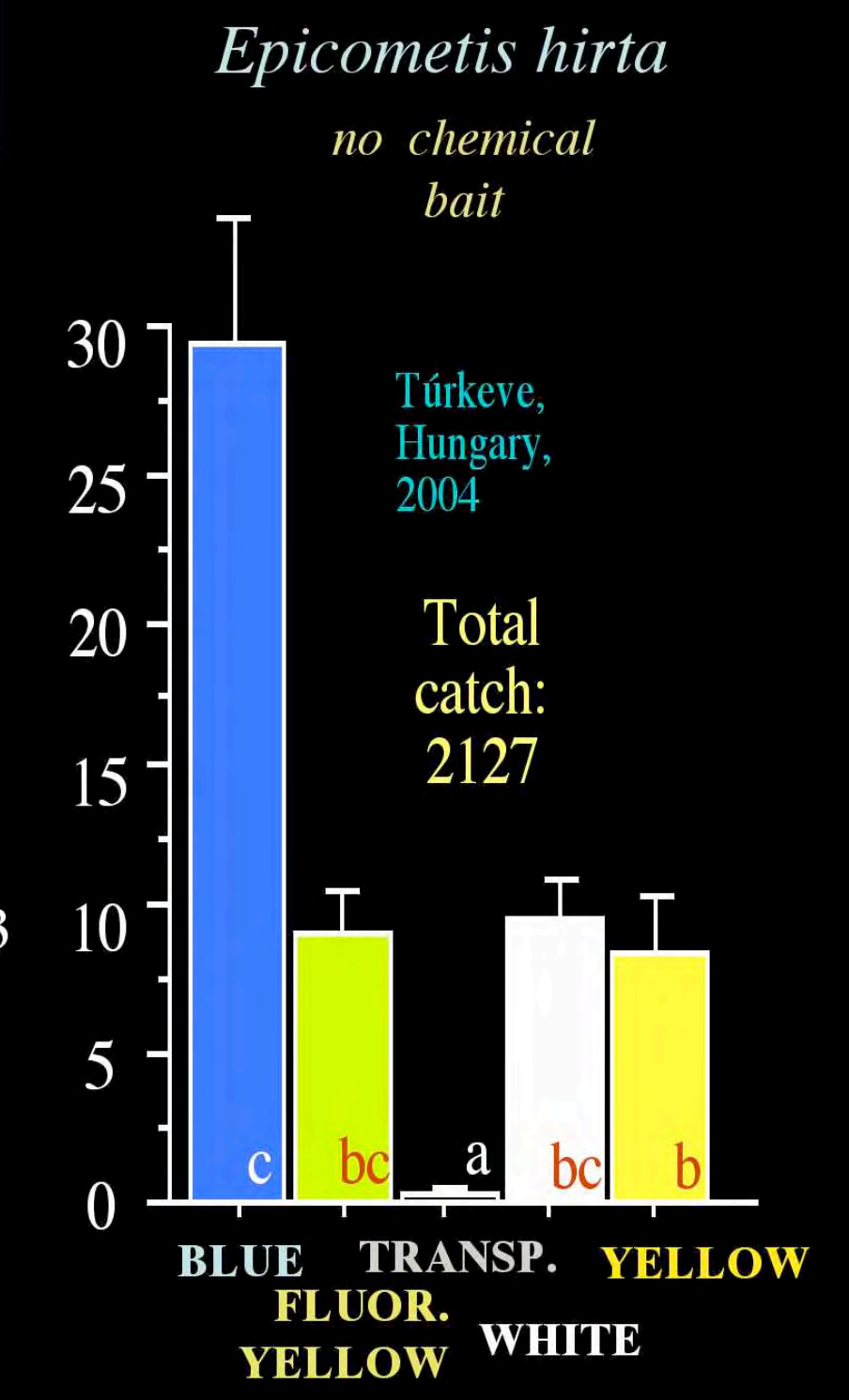
Agård,
April 15 - May 6 1999

Epicometis hirta

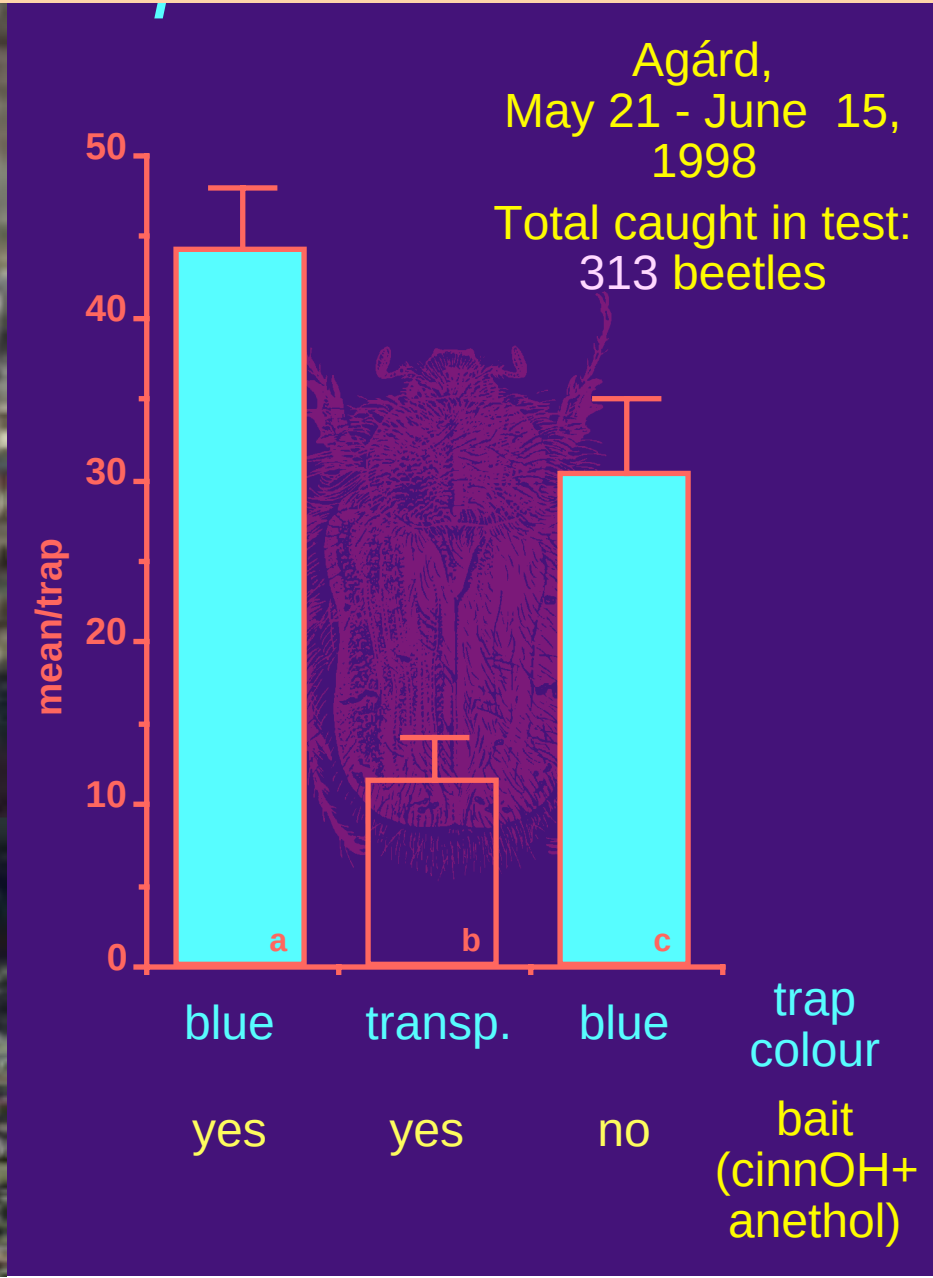
Total caught in test:
939 beetles



As a flower visitor, *E. hirta* also responded strongly to colour cues.



Consequently, we developed a trap for *E. hirta* containing both the floral bait and blue colour.



This trap is capable of catching thousands of beetles and its application decreased damages in backyard strawberry fields.

Foto: I. Sivcev

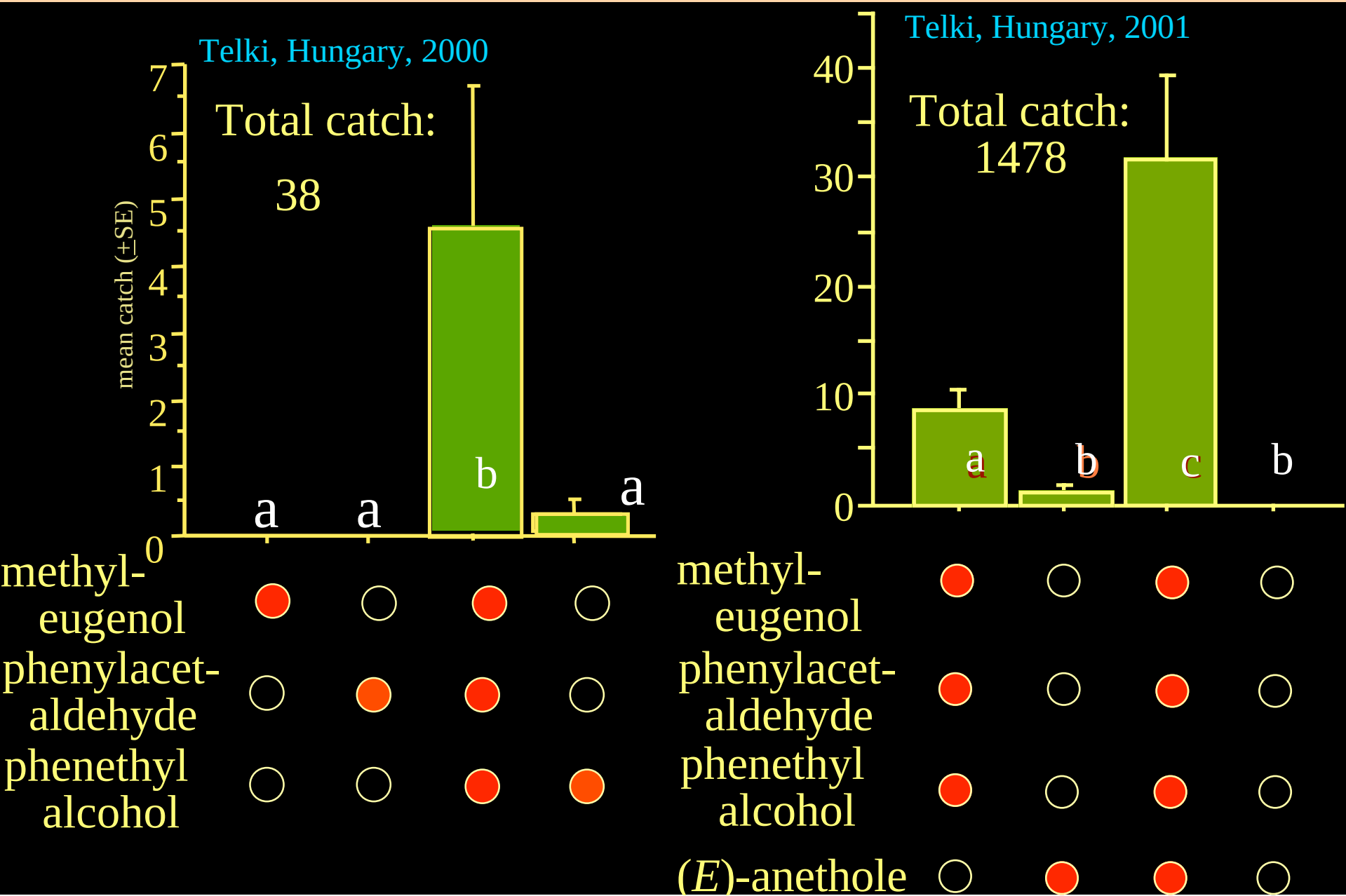

Foto: I. Sivcev


Foto: I. Sivcev

Large-scale mass trapping applications in industrial strawberry fields also gave promising results.

A close relative is *Cetonia a. aurata*. In recent years reports on damages of this pest increased in Hungary. Similar news were coming also from Croatia.

For attracting *Cetonia* a multicomponent chemical attractant was necessary.



Cetonia did not response to colours *per se*, but in the presence of the chemical attractant showed a slight preference for blue.

CSALOMON® VARb3
modified funnel traps

Foto: Tóth M.

Telki, Hungary, 2003

traps with chemical bait

Total catch: 10483

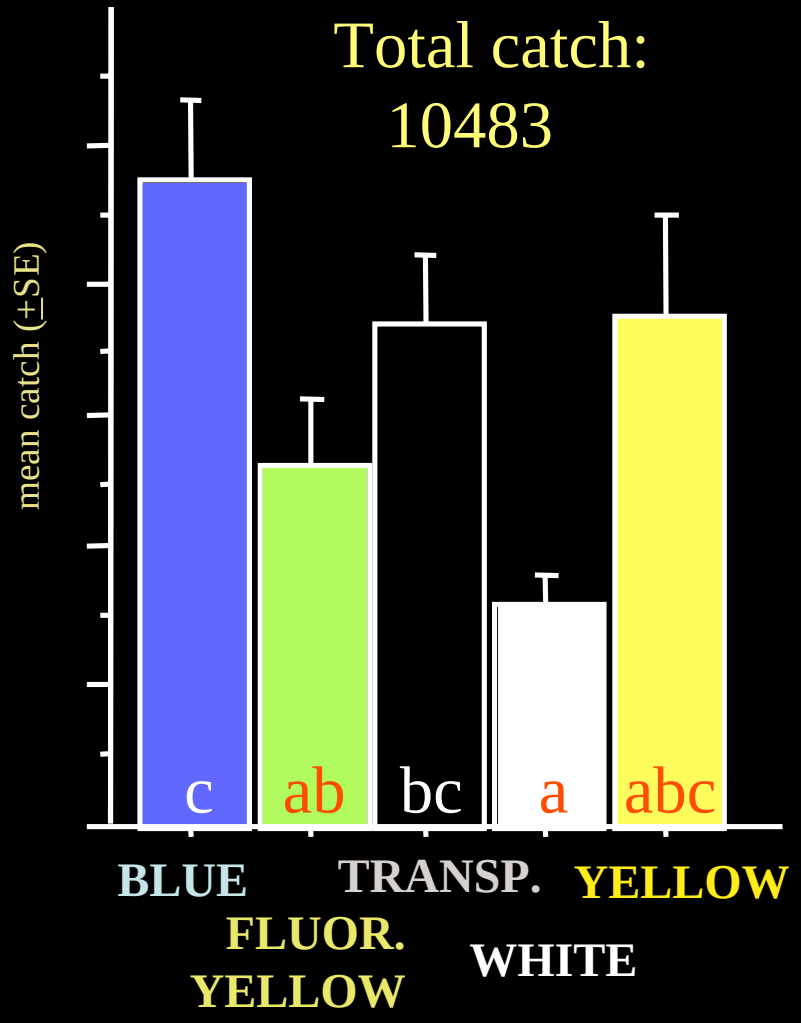


Foto: Tóth M.

Foto: Salamon P.

Cetonia
a. aurata

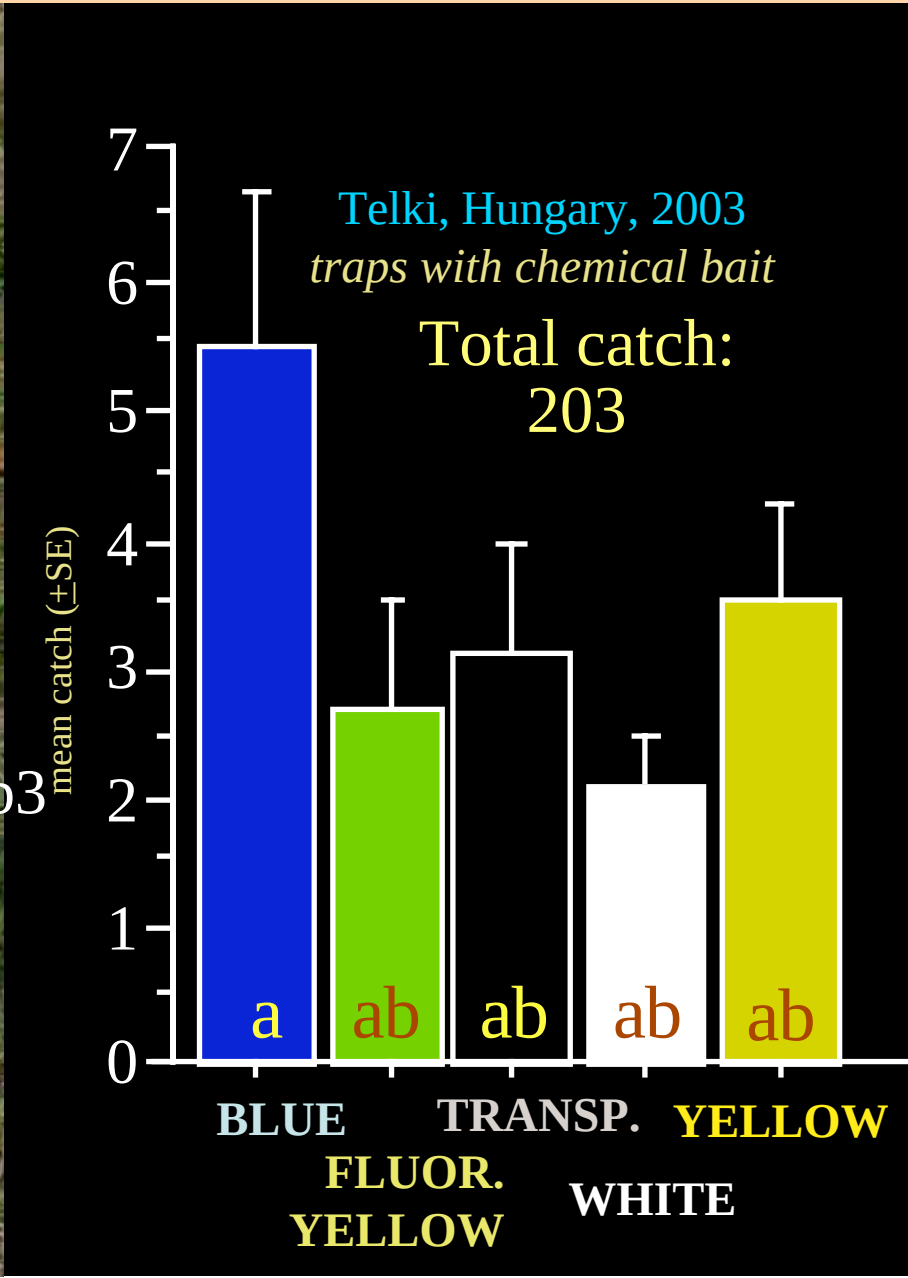
Potosia
cuprea

Foto: Molnár B.

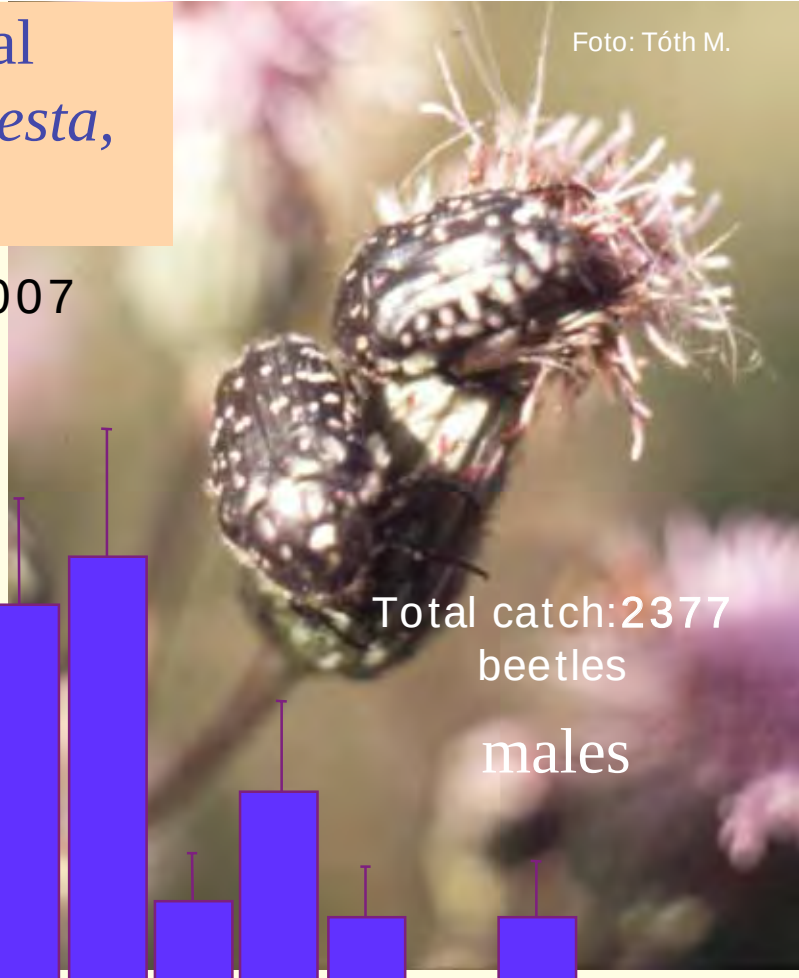
Foto: Molnár B.

Traps developed for *Cetonia* also caught the similarly looking *Potosia cuprea*, another important pest of Cetoniinae.

In its responses to both chemical and visual cues *P. cuprea* proved to be very similar to *Cetonia*.

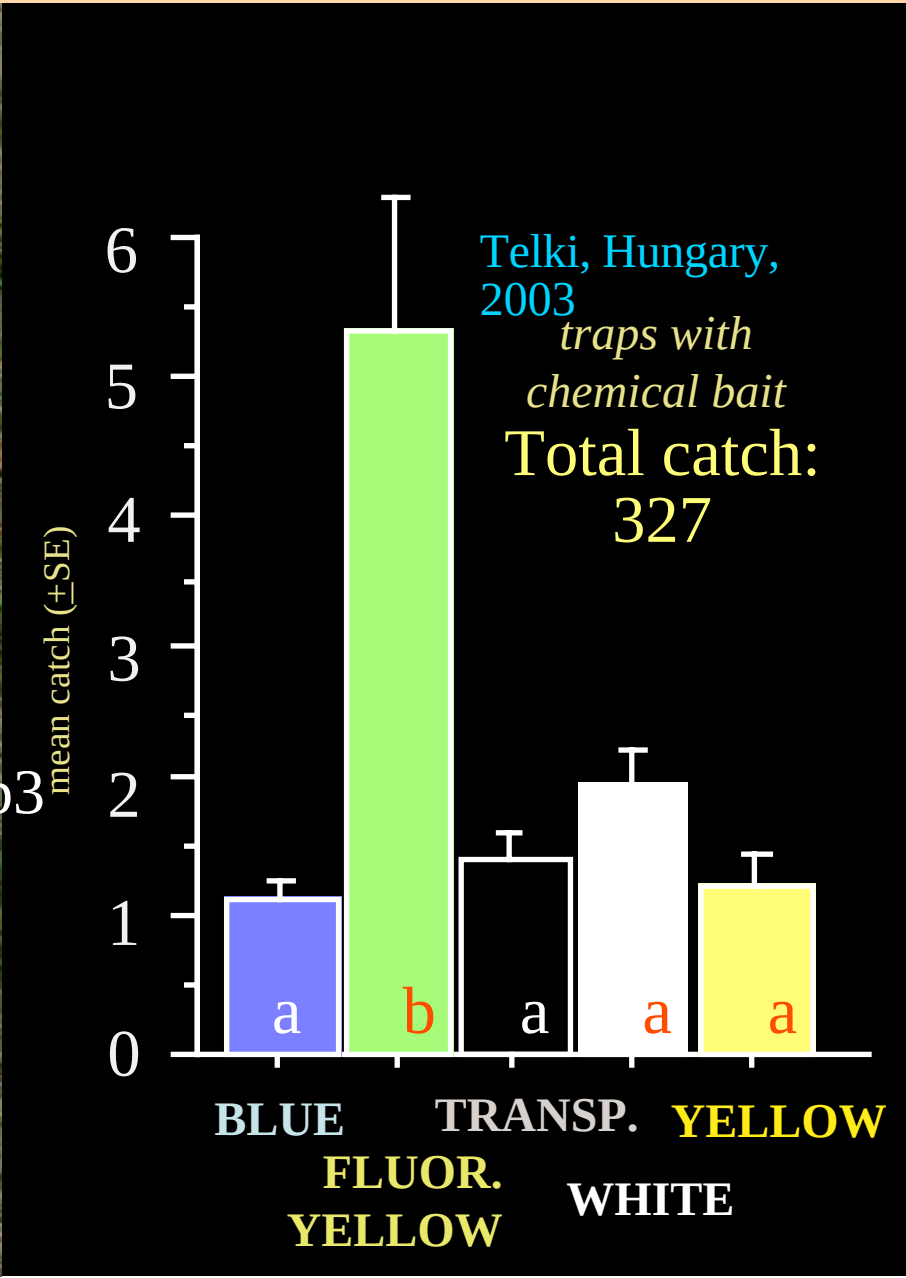


In further extensive field tests a binary floral attractant was optimized for *Oxythyrea funesta*, a secondary cetoniin pest.



Julianna major, 12 June-9 July, 2007

O. funesta drastically differed from all previous species in which it responded very strongly to fluorescent yellow.



Finally we ended up with the following traps developed for the different cetoniin pests:

VARb3k blue trap

- with *E. hirta* bait = EP

OR

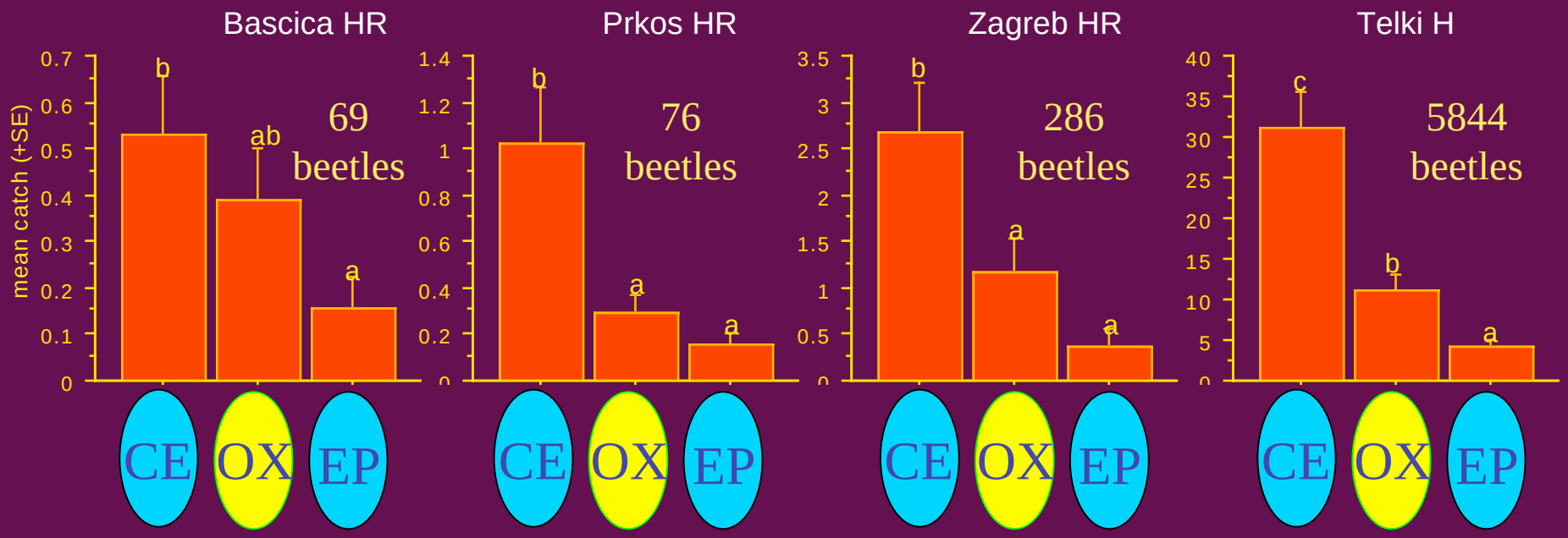
- with *Cetonia / Potosia* bait = CE

VARb3z fluorescent yellow trap

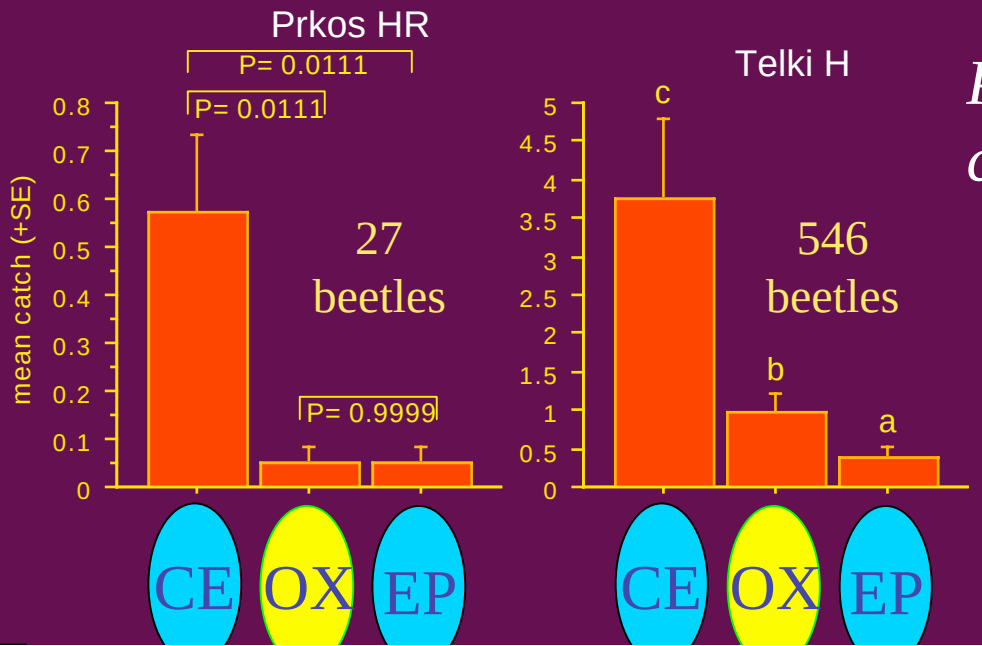
- with *O. funesta* bait = OX

These traps were parallelly tested for performance and specificity in several European countries.

Cetonia a. aurata

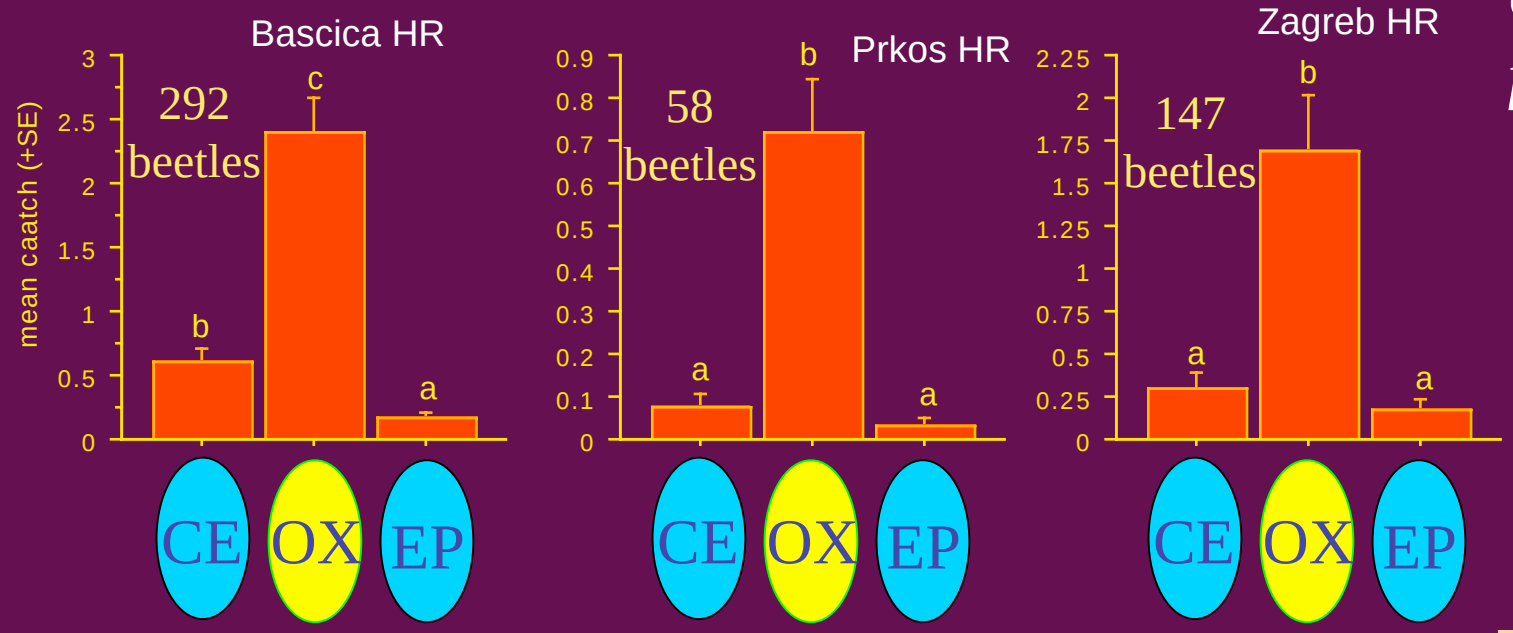


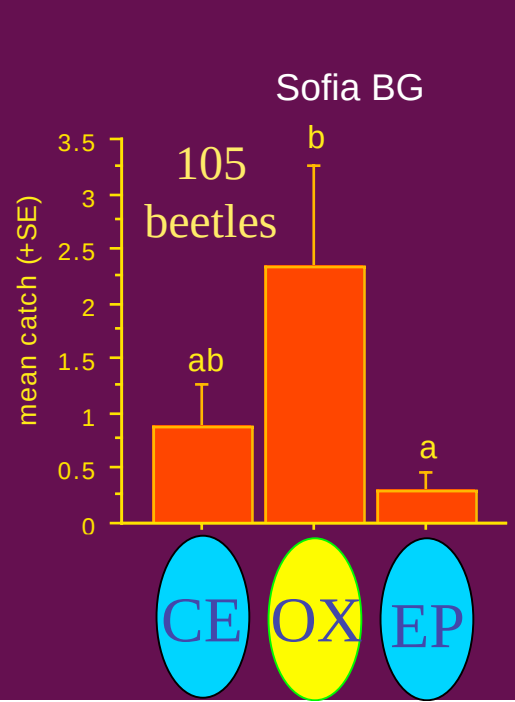
The target species usually were best attracted to their respective trap/bait combinations, as seen for *Cetonia* and *Potosia* here, which were captured at relatively few sites.

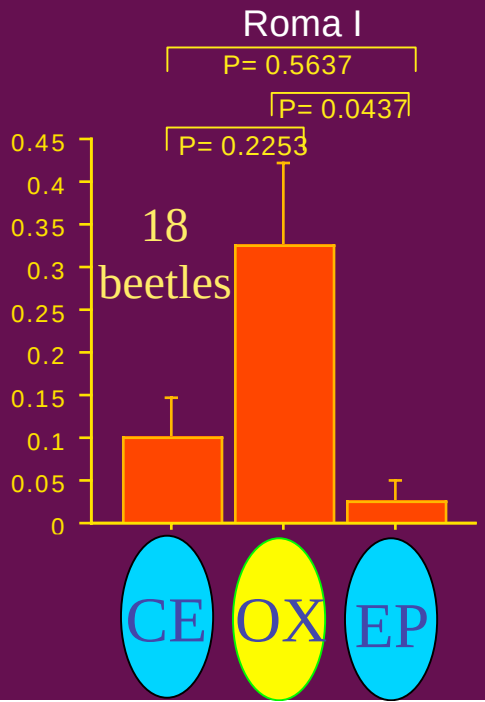


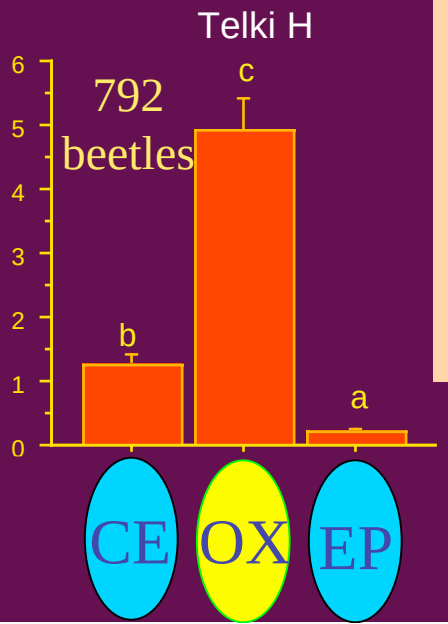
Potosia cuprea

Oxythyrea funesta



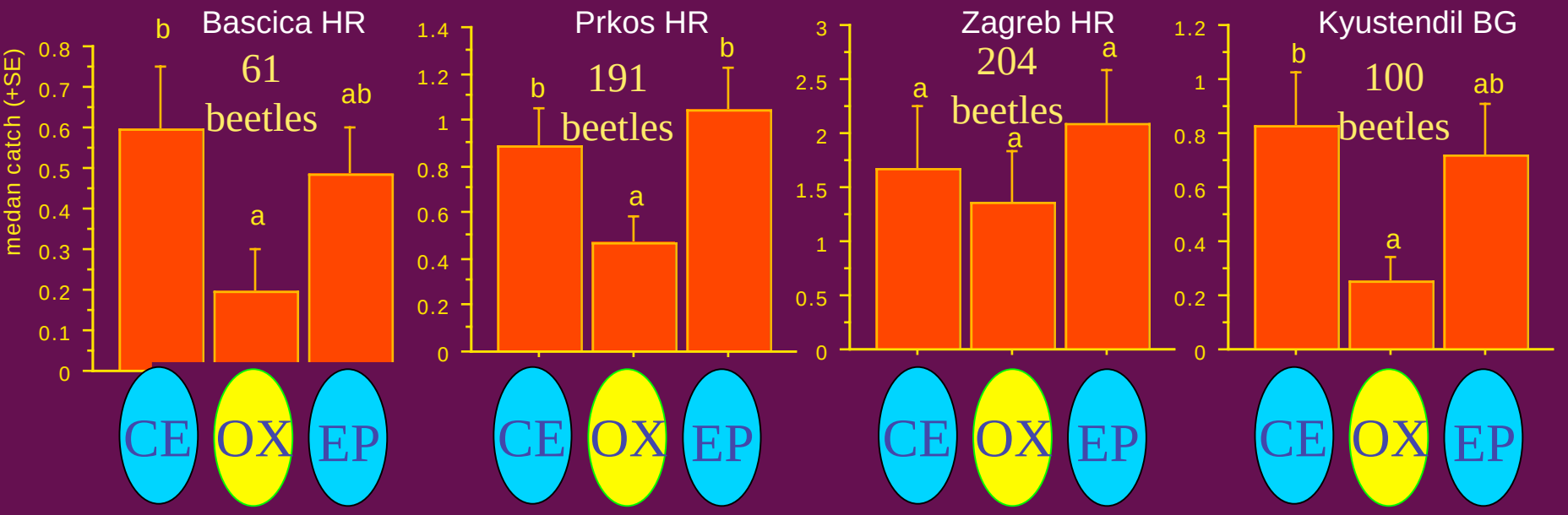


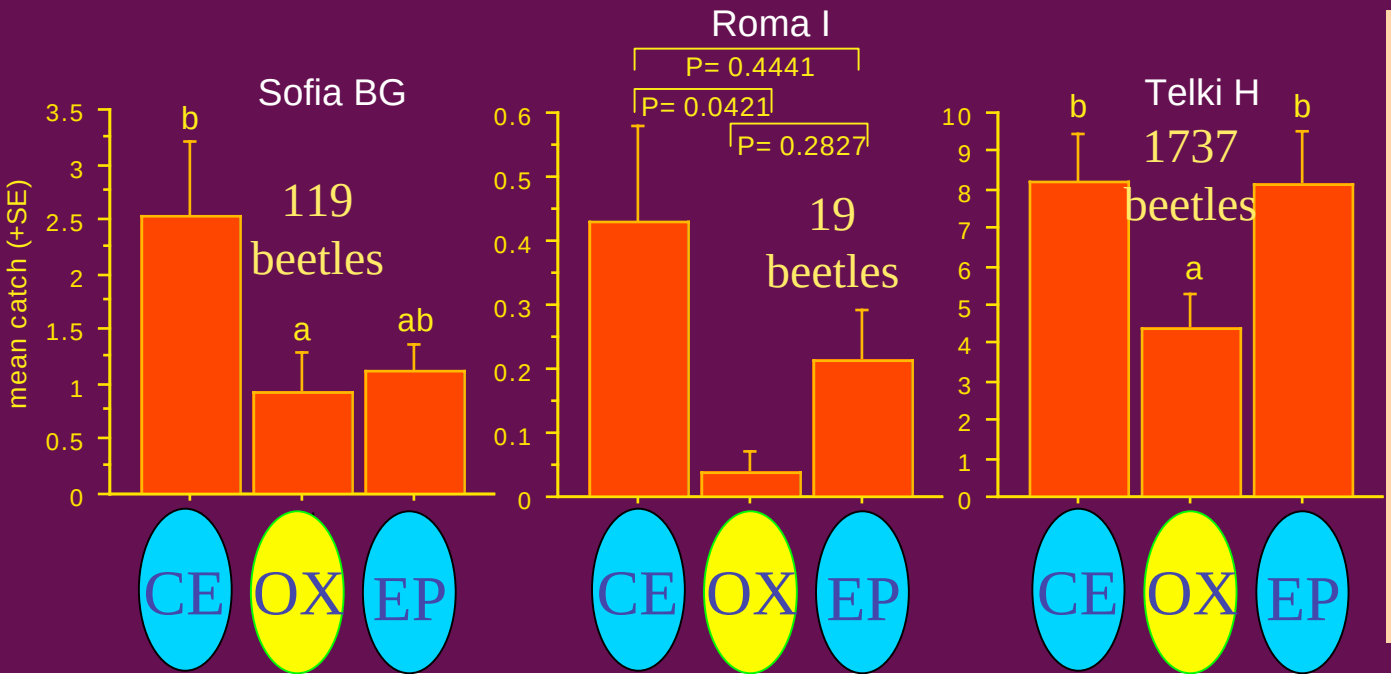




O. funesta showed perhaps the clearest preference for its trap.

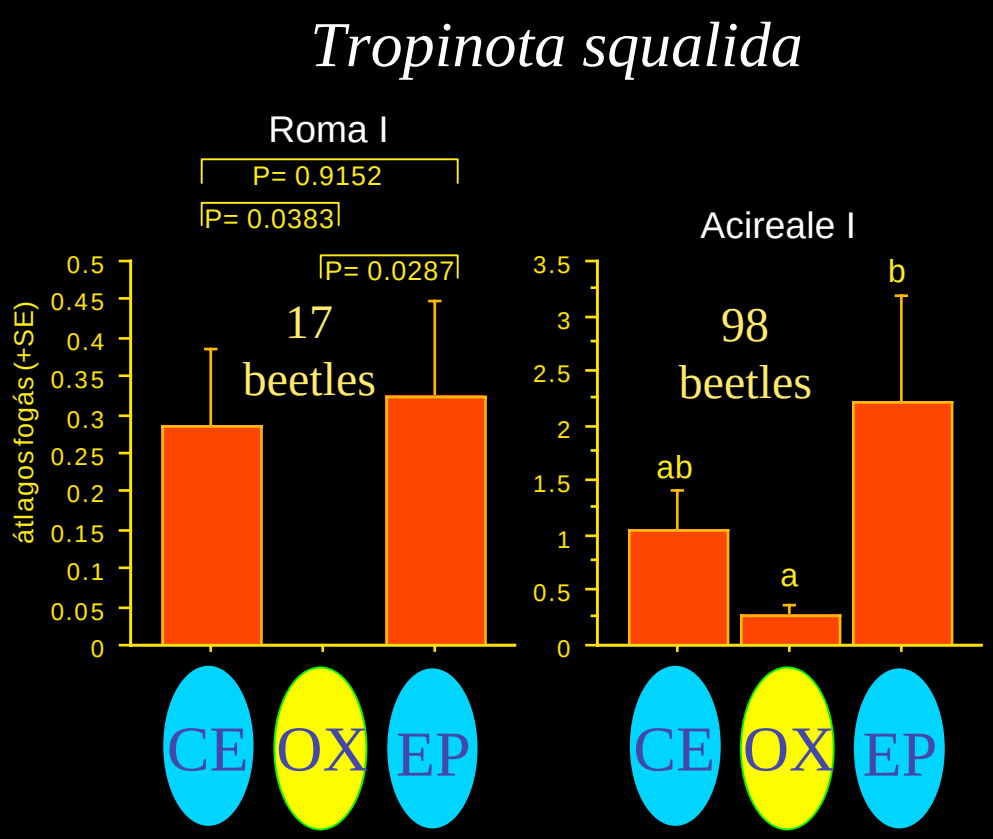
Epicometis hirta



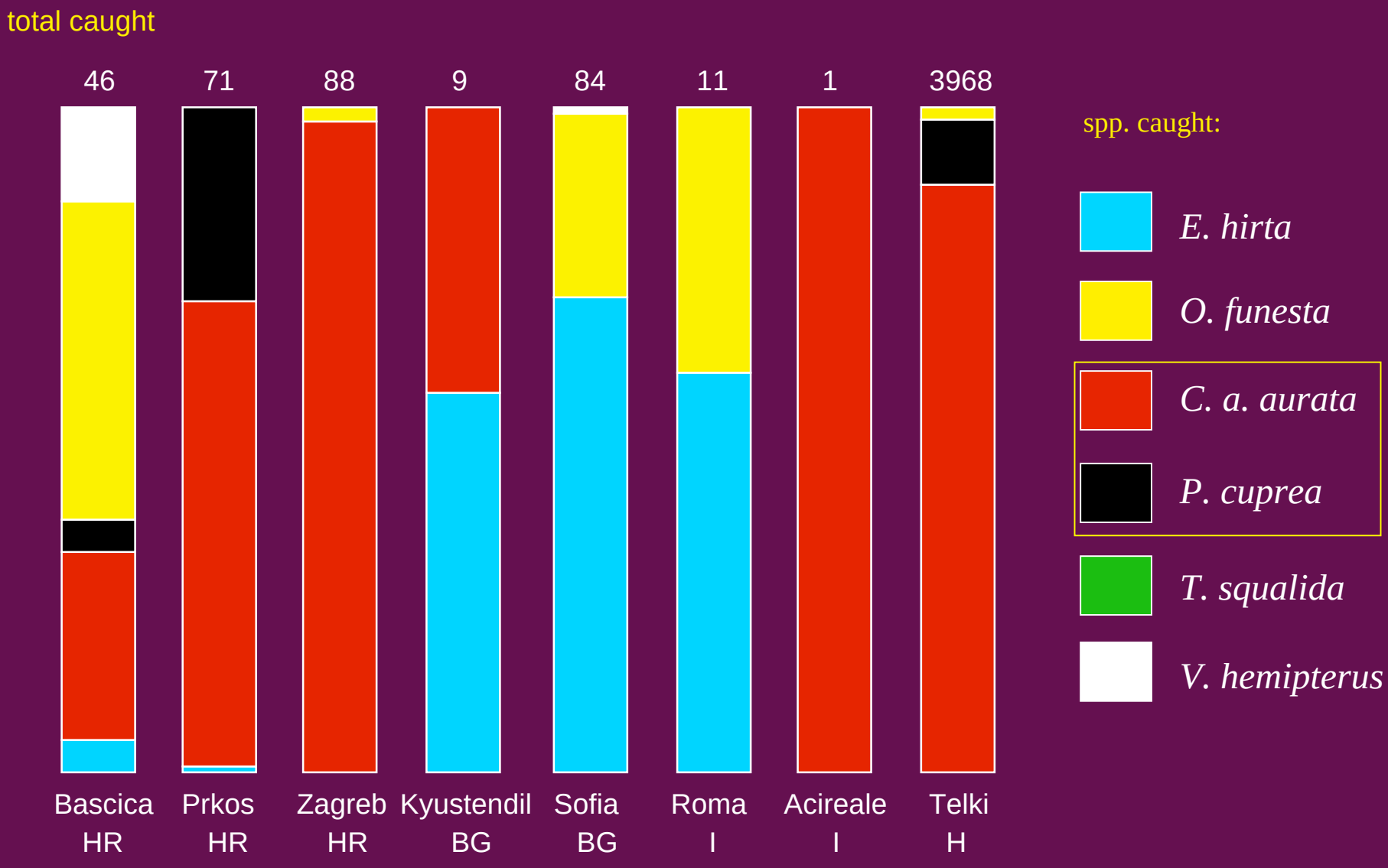


E. hirta, which showed least preference, responded equally well to both EP and CE combinations, and was caught at most sites

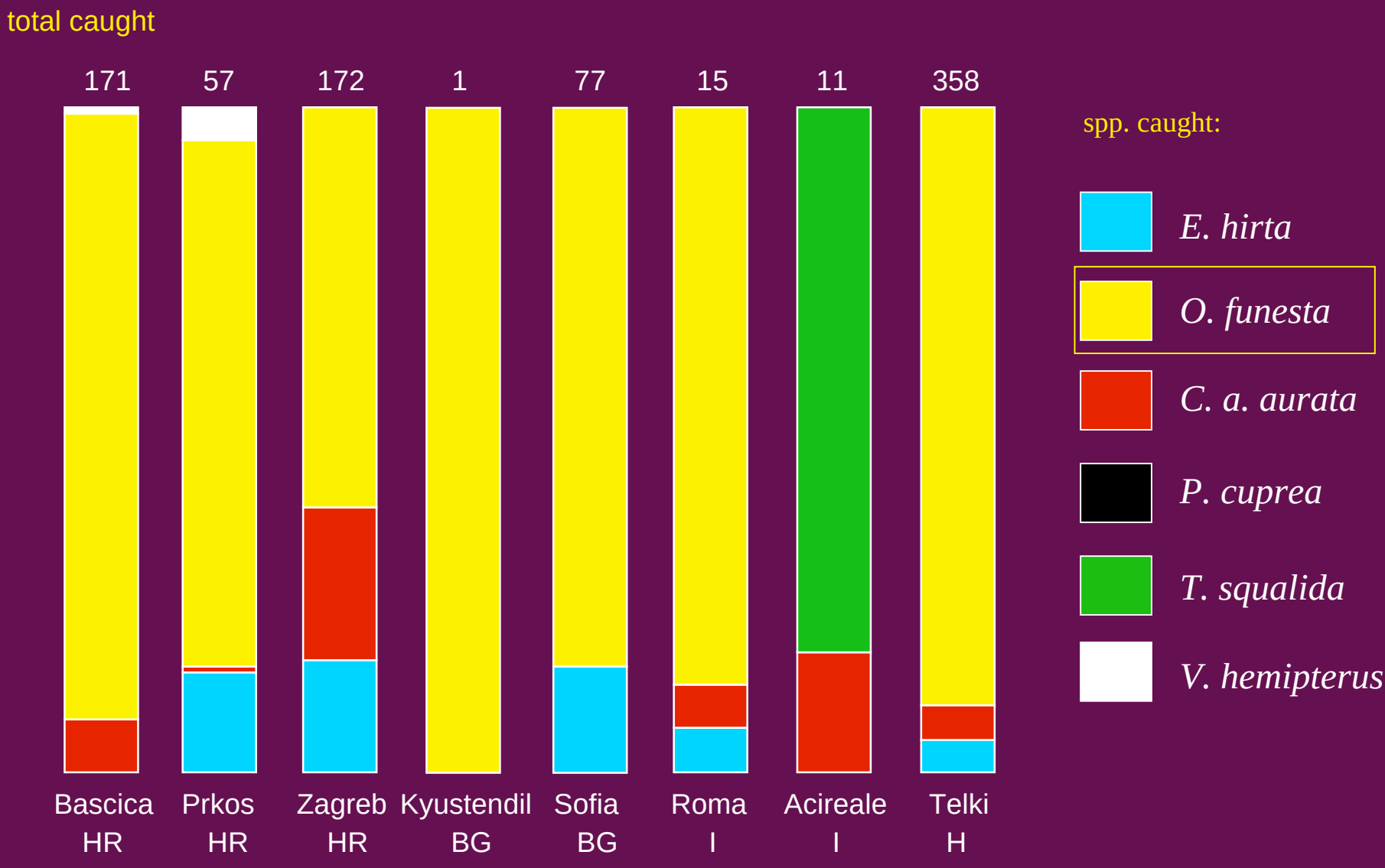
Among further species captured, at sites in Italy, the more southerly-occurring *Tropinota squalida* was recorded. It responded a similar way to responses of *E. hirta*, to which it is morphologically also very close.



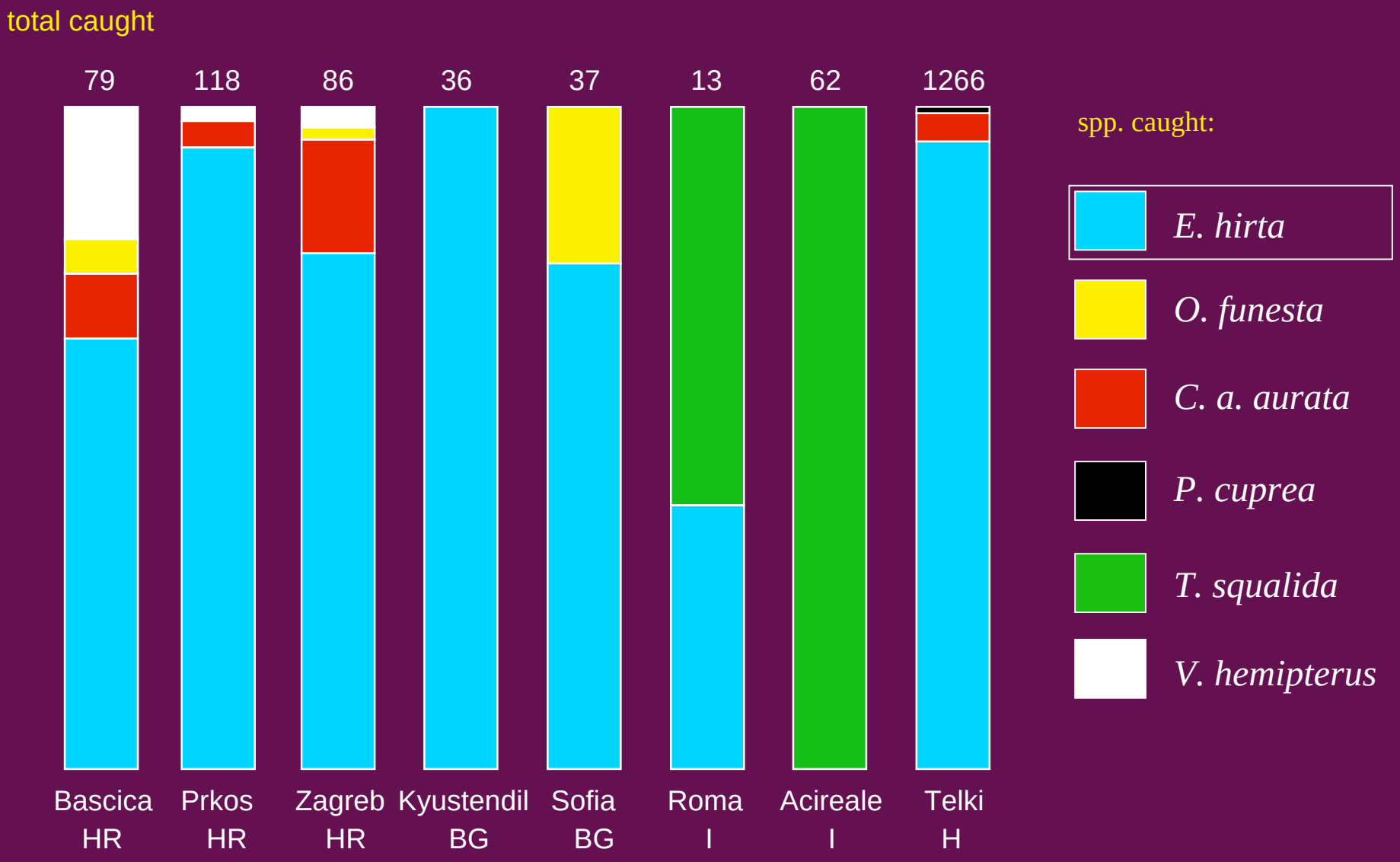
Selectivity of combination CE during the swarming period of the target spp. (*Cetonia / Potosia*)



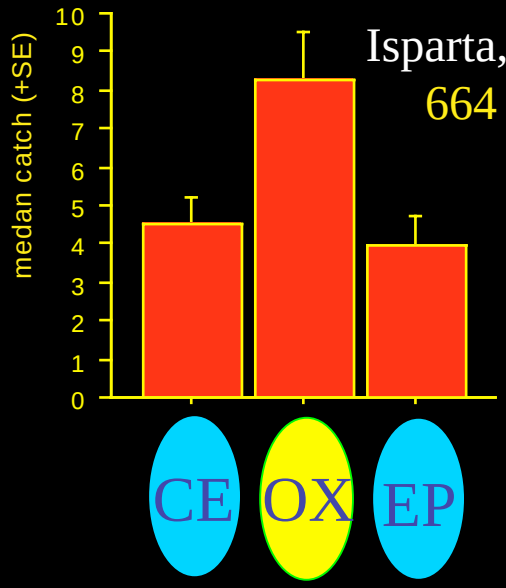
Selectivity of combination OX during the swarming period of the target spp. (*O. funesta*)

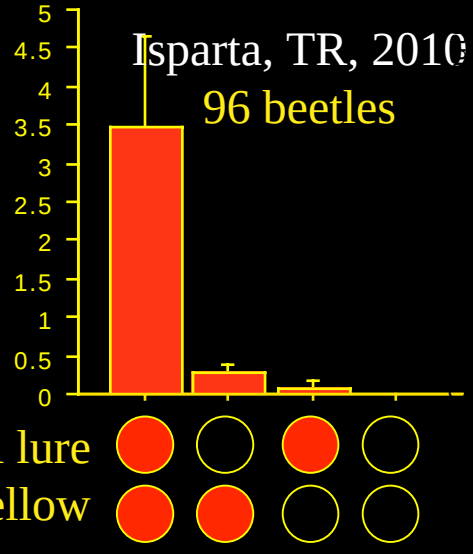


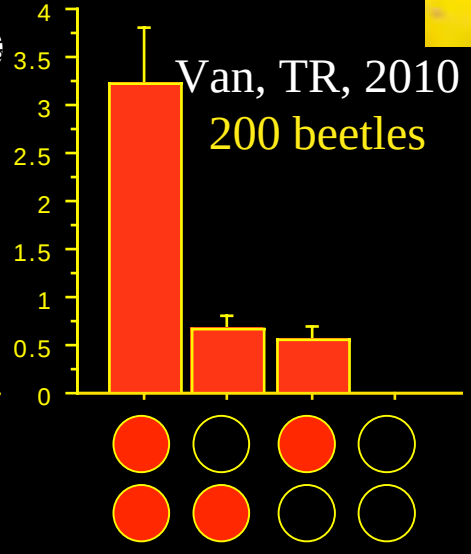
Selectivity of combination EP during the swarming period of the target spp. (*E. hirta*)



Most recent results: catches of *Oxythyrea cinctella* in Turkey! The species is an important cetoniin pest in the Middle East.







Both chemical AND visual stimuli are necessary for good activity.

Summing it all up, application of three types of traps combining optimal floral (chemical) and colour (visual) cues are capable of trapping the 6 major cetoniin pests in Europe and the Middle East.
First results suggest that the traps – beyond detection and monitoring – will be useful for directly suppressing damages through mass trapping.

Special thanks are due to all colleagues participating in one or more parts of this research: Bozena Baric (HR), Francesca DiFranco (I), Katalin Harmincz (H), Zoltán Imrei (H), Tibor Jermy (H), Michael G. Klein (USA), Aliena Mircheva (BG), Josip Razov (HR), Dénes Schmera (H), Ivan Sivcev (SRB), Ivan Sredkov (BG), Mitko Subchev (BG), István Szarukán (H), Árpád Szentesi (H), László Szőllős (H), Rosaria Tabilio (I), Ivan Tomasev (SRB), Teodora Toshova (BG)