

Recent Research on Invasive Weeds at the European Biological Control Laboratory (EBCL)



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United States Department of Agriculture
Agricultural Research Service
Montferrier-sur-Lez, France

EBCL labs in France and Greece



Other USDA-supported labs:

Argentina – South American Biological Control Laboratory (FuEDEI)

Australia – Australian Biological Control Laboratory

China - Sino-American Biocontrol Lab

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OBCL Newsletter

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U.S.D.A., Agricultural Research Service

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European Biological Control Laboratory - EBCL

Fortuitous Biological Control of citrus longhorned beetle in Italy

by Franck Héran, Malvo Mussero, Gérard Devare, Marie-Claude Bar, Ying Cen, Masatomo Mochizuki, Tamotsu Morai and Nathalie Ramawie

Citrus longhorned beetle (*Anoplophora chinensis*, CLB) was accidentally introduced from Asia into 11 countries of Europe and Turkey putting at risk a wide range of broadleaf trees. Destruction of infested trees is mandatory in many countries in an effort to eradicate the pest. An EBCL scientist surveyed for natural enemies attacking CLB and found 9 species of parasitoids attacking eggs and/or larvae. One of these, *Aprostocetus fukutai*, appears to be highly specific, parasitizing eggs of CLB, but not of the closely related Asian longhorned beetle (*Anoplophora glabripennis*, ALB) (Fig. 1). An integrative taxonomy approach including a multigene sequencing analysis confirmed the species identity of this parasitoid, which apparently was accidentally introduced to Italy from Japan, possibly by infested bonsai trees. A colony of the parasitoid was established in the EBCL quarantine laboratory, and an EBCL scientist developed methods to release the parasitoid and to monitor its presence using infested sentinel logs or potted tree stumps. Parasitism rates of up to 72% have been measured in the field, suggesting that this parasitoid is helping to limit the multiplication of the pest. It is hoped that a similar parasitoid can be found for ALB, which is a major invasive pest in the USA.

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Introduction

OBCL is a group of overseas laboratories that support the domestic research carried out by USDA-ARS with the aim of "finding solutions to agricultural problems that affect Americans every day from field to table".

The Australian Biological Control Laboratory (ABCL) is based in Bimblett, Australia. The facility is run through a Specific Cooperative Agreement between USDA-ARS and Australia's Federal research body, CSIRO. This has been a long term relationship originating in 1985. Contact: Matthew Parcell, matthew.parcell@csiro.au

The European Biological Control Laboratory (EBCL) is based at Montpellier, France, and has a satellite laboratory in Thessaloniki, Greece. It has a permanent staff of 1 American and 7 foreign scientists, 9 technicians and 5 administration/support. Contact: Lincoln Smith. Link.Smith@ars.usda.gov

The Foundation for the Study of Invasive Species (FuEDEI) is based in Huntington, Argentina and is operated as a nonprofit research organization. Contact: Guillermo Cabrera Walsh. g.cabrera@fudei.org

The Sino-American Biocontrol Laboratory (SinoABL) is based in Beijing, China. Contact: Liu Chenxi. liuchenxi@caas.ac.cn



Figure 1. Female *Aprostocetus fukutai* laying eggs in a citrus longhorned beetle egg in the bark of a tree.

European Biological Control Laboratory



Quarantine for insects and pathogens



Glasshouses

Field garden experiments

Weed Targets

French broom (*Genista monspessulana*)

Giant reed (*Arundo donax*)

Hoary cress (*Lepidium draba*)

Medusahead (*Taeniatherum caput-medusae*)

Yellow starthistle (*Centaurea solstitialis*)

Also support:

African wire grass (*Ventenata dubia*)

Russian thistle (*Salsola tragus*)

Saltcedar (*Tamarix* spp.)

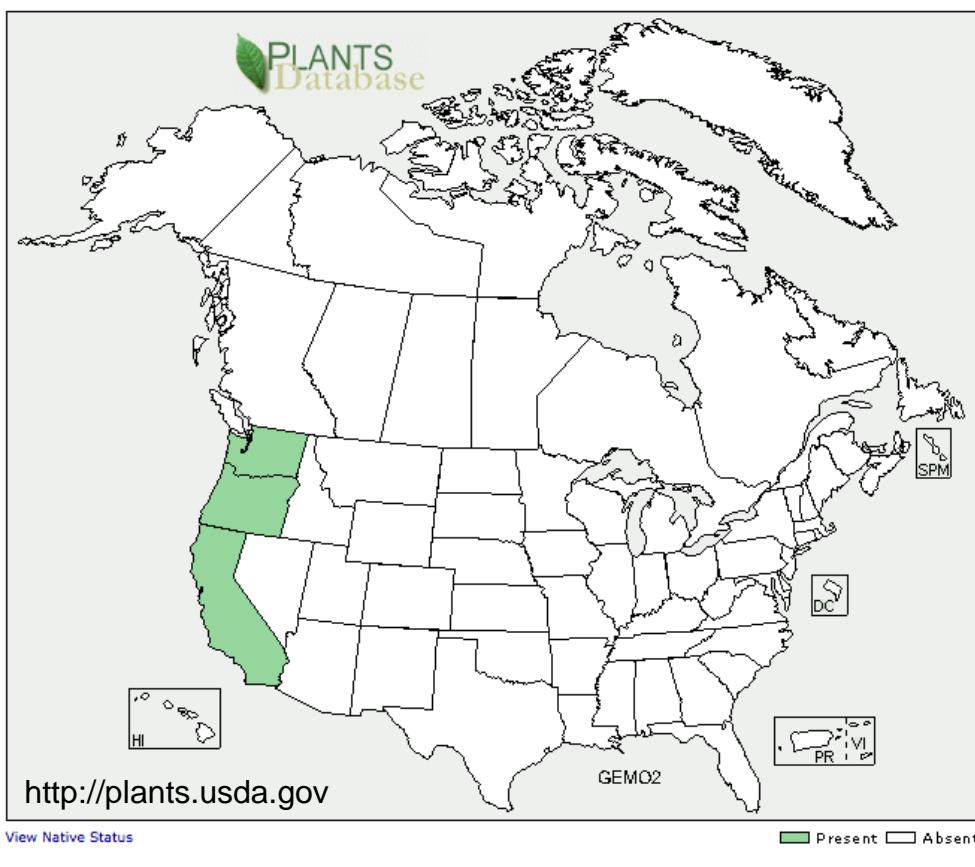
Scotch thistle (*Onopordum* spp.)

Swallow-worts (*Vincetoxicum* spp.)

? **Sahara mustard** (*Brassica tournefortii*)

French Broom (*Genista monspessulana*)

Genista monspessulana (L.) L.A.S. Johnson



French broom

Genista monspessulana



Chloé Descombe

Chemical ecology of psyllid
Arytinnis hakani (Gaylord Desurmont)



www.gonhs.org/Lepidapionargentatum.htm

Specificity & impact of weevil
Lepidapion argentatum (René Sforza)



French broom killed by psyllid (*Arytinnis hakani*) in Australia



French Broom Psyllid (*Arytinnis hakani*)

Kills Fr. broom in Australia.

27 lupine species have been tested.

Can develop on some lupines.

Field testing in France.



Laboratory choice tests:
Lupines vs. French broom





French Broom Weevil

Lepidapion argentatum



Develops in seeds ...



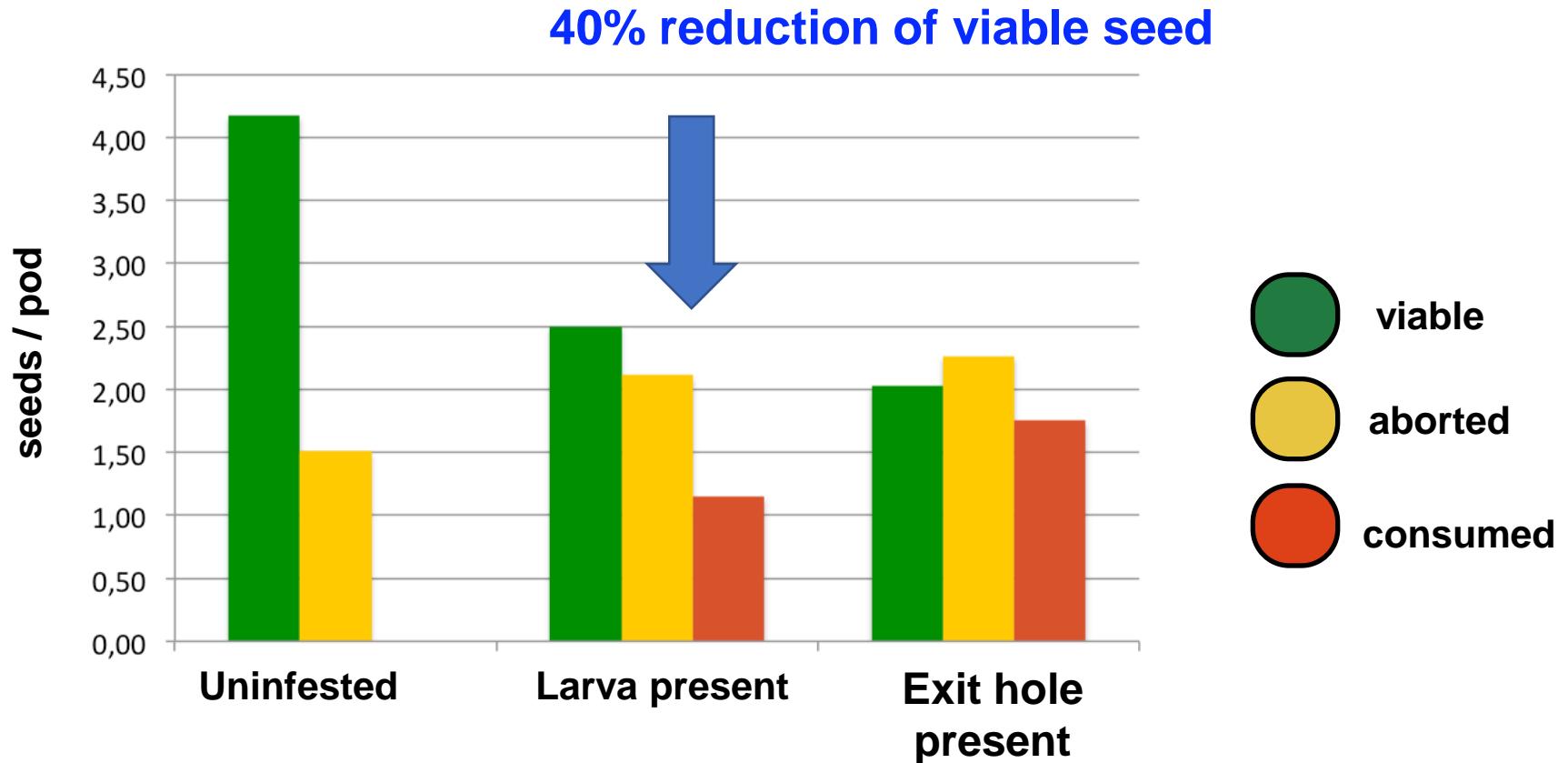
T. Thomann

and in stem galls



René Sforza (EBCL), Thierry Thomann (CSIRO)

Impact of *Lepidapion argentatum* on French broom seed production

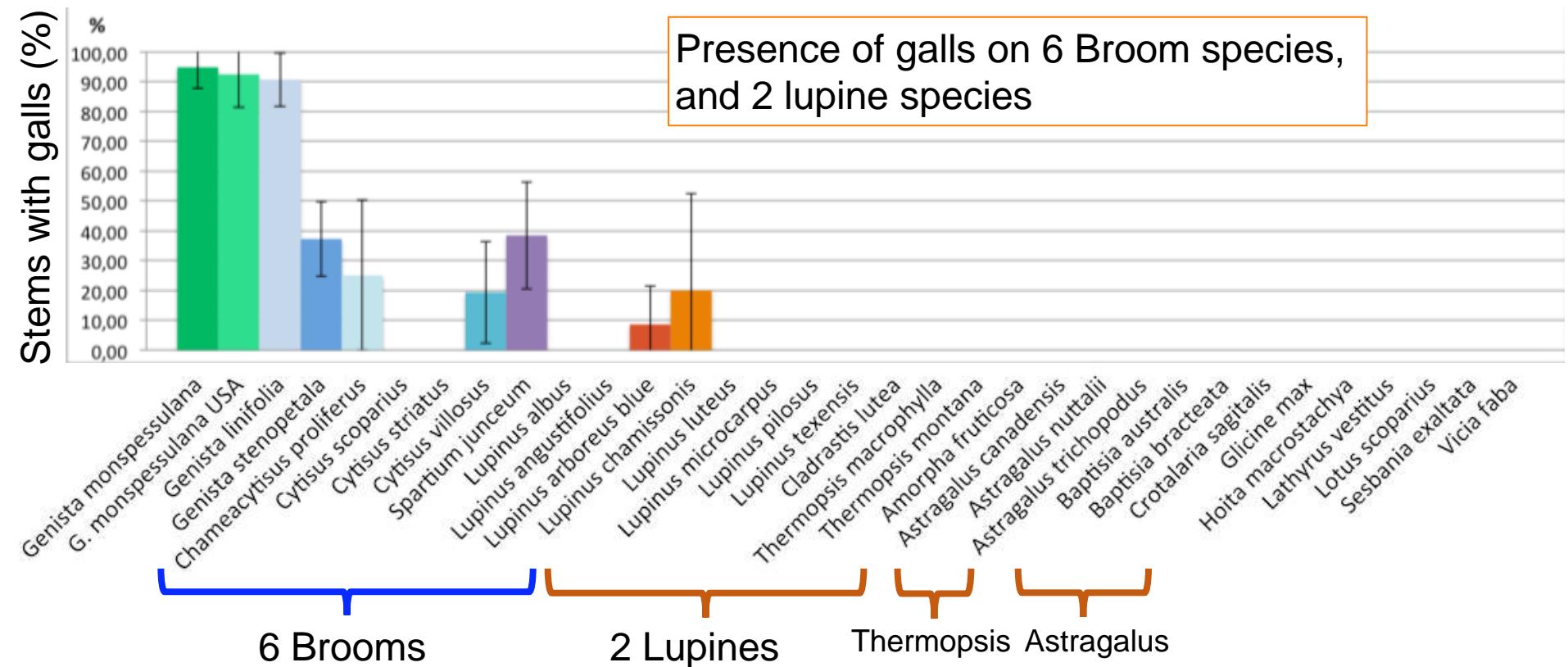


Host Plant Specificity of *Lepidapion argentatum* on 32 plant species

No-Choice Oviposition Tests



Presence of galls on 6 Broom species,
and 2 lupine species



Giant Reed (*Arundo donax*)



Glen county CDFA gall wasp release site

Biological Control Agents for Arundo

Stem tip-galling wasp

Tetramesa romana

adventive in southern CA;

Released in TX in 2007;

20% decrease biomass in 5 yrs



Root- and stem-feeding armored scale

Rhizaspidiotus donacis -

Released in TX, CA

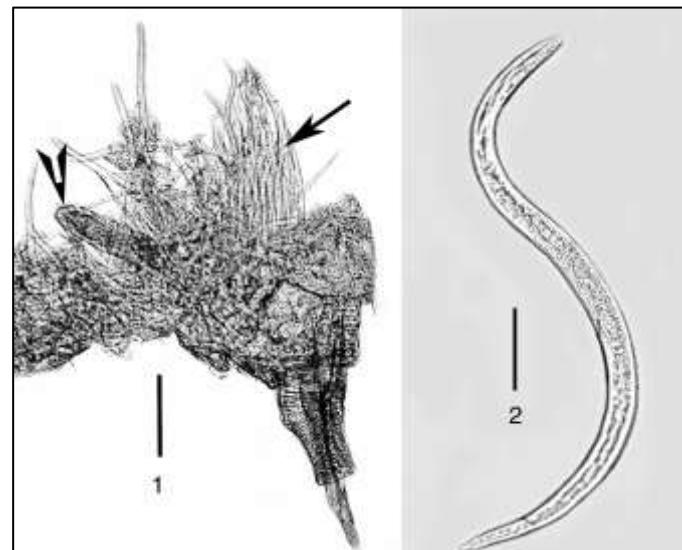
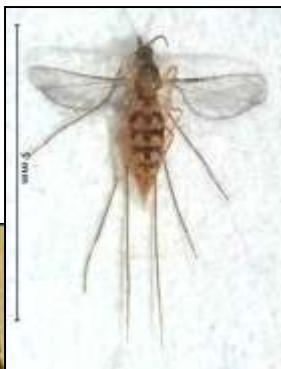


Shipments of Arundo Agents

Leaf sheath miner

Lasioptera donacis

Petition approved



Tripius gyraloura, 1) Cluster of parasitic juveniles (arrow) in a dissected female fly; 2) Free-living infective female. Scale-bars: 1) 144 µm; 2) 20 39 µm.

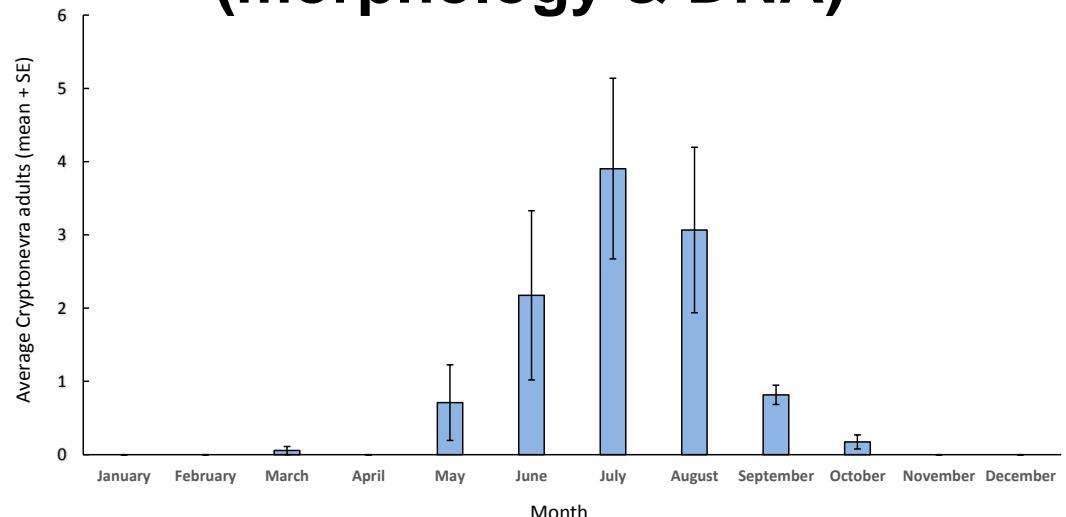
Oviposition by single females to establish nematode-free infestations for shipment to Texas

Arundo Shoot Fly

Arundo fly *Cryptonevra* sp.



- Collection of flies from Phragmites and Arundo
- Seasonal abundance
- Potential efficacy
- Integrative taxonomy (morphology & DNA)



Gaylord Desurmont
John Goolsby, (ARS, Edinburg, TX)

Medusahead (*Taeniatherum caput-medusae*)

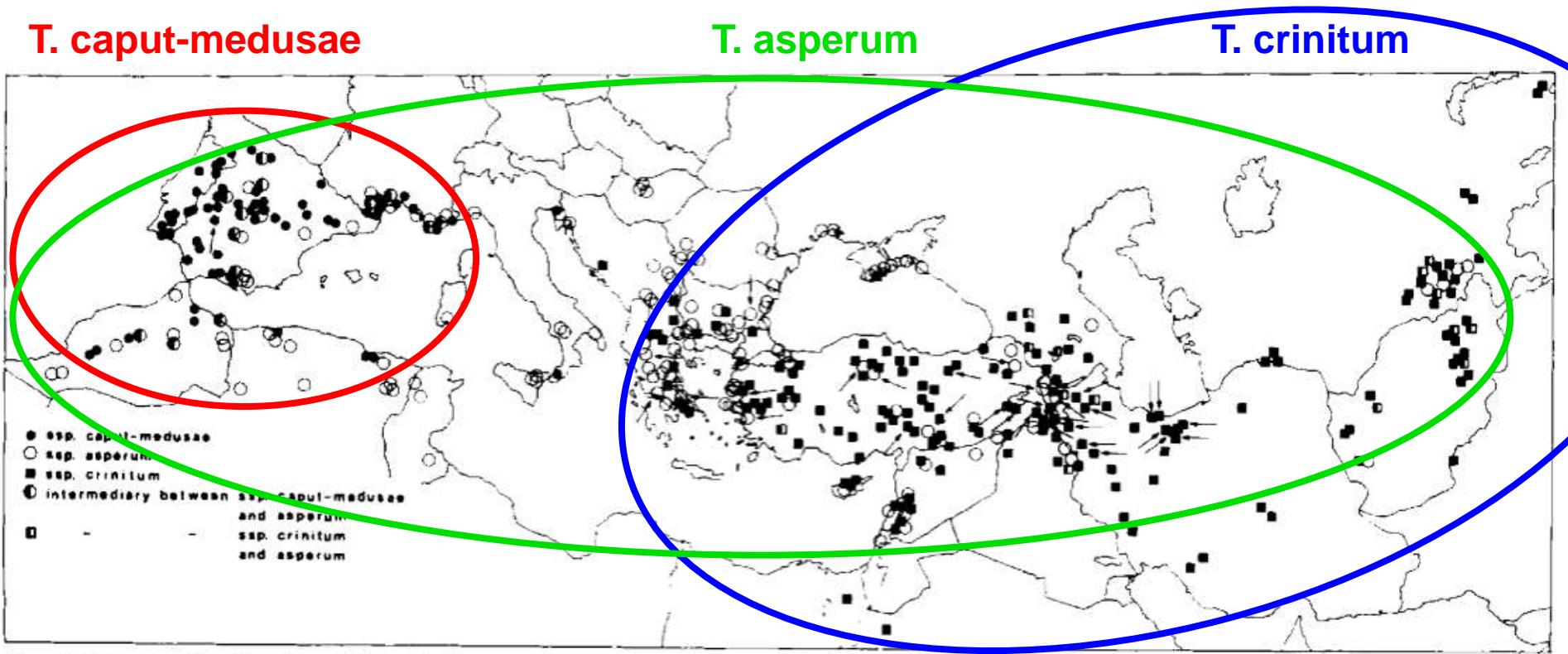
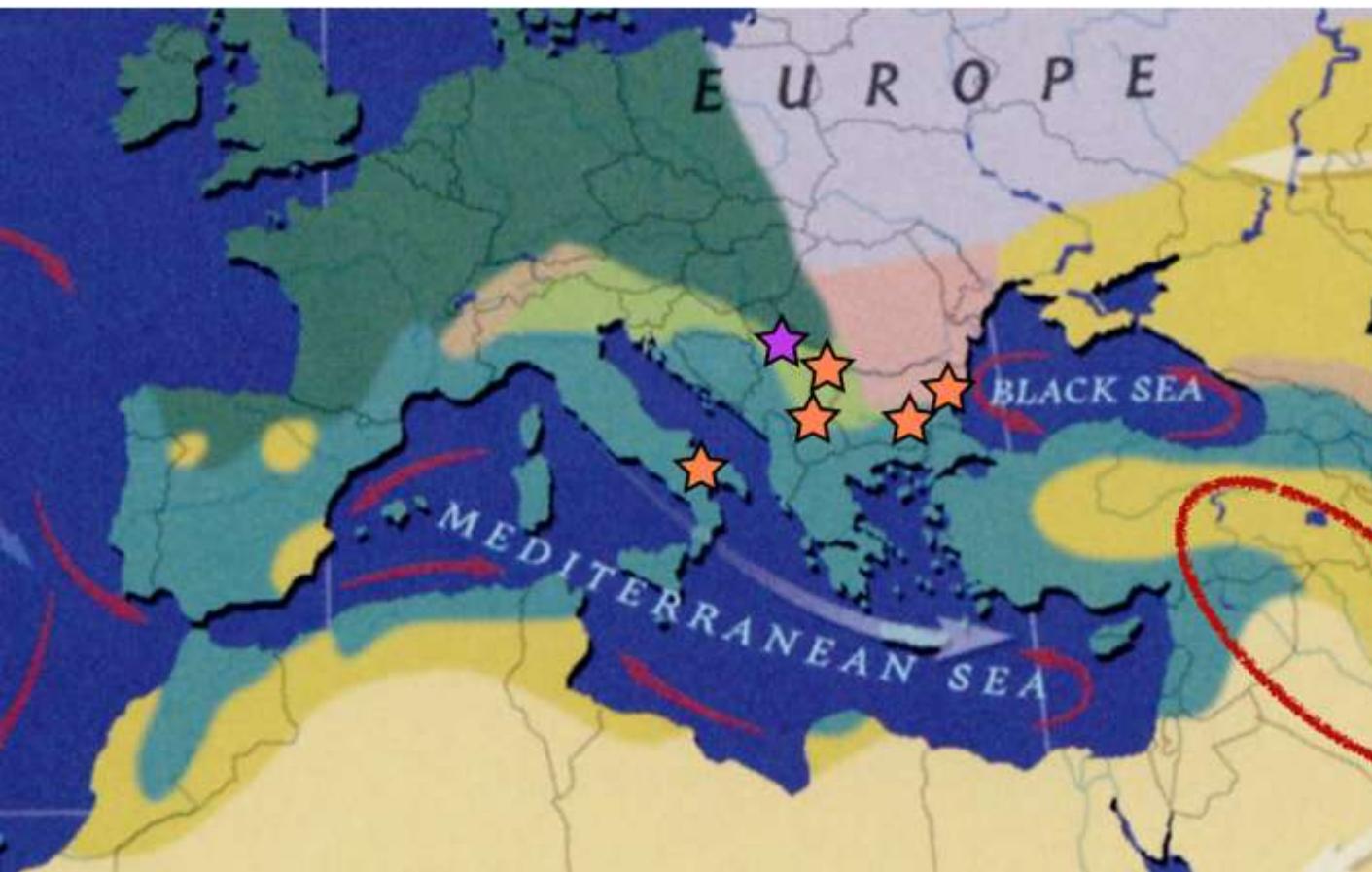


Fig. 8. Known distribution of *Taeniatherum*. Arrows indicate populations from which chromosome numbers ($2n=14$) have been determined.

Eriophyid mite on medusahead



Aculodes altamurgiensis

★ = cheatgrass mites found

★ = medusahead mites found

○ = presumed medusahead center of origin

Other Prospective Agents of Medusahead



Moth larva
inside leaf



Dicraeus sabrovskyi
(Dipt., Chloropidae)



Pachytychius hordei squamosus (Col.: Curculionidae)

Midge? But so far, only Eulophid
parasitoids have been reared out



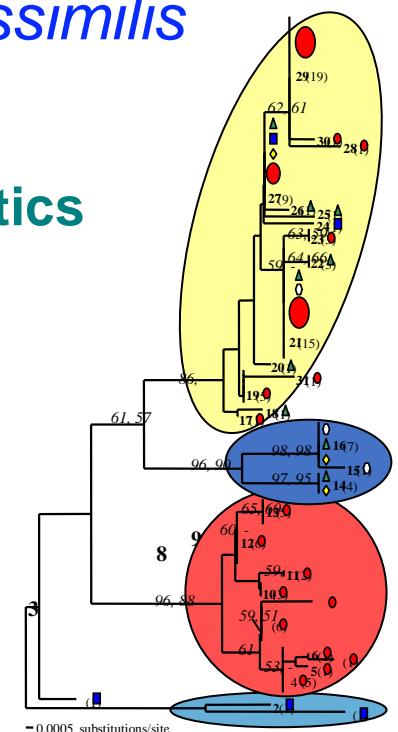
Hoary Cress: *Lepidium draba*



Root Galling Weevil

Ceutorhynchus assimilis

Molecular Genetics distinguished a Cryptic Species



One host race strictly associated with *L. draba*,
distributed in Southern France/Northern Spain



Yellow Starthistle

*Centaurea
solstitialis*



J. DiTomaso, UC Davis

Yellow starthistle seedhead weevil, *Larinus filiformis*



Multiplied weevil from Bulgaria for future testing.





Russian thistle
Salsola australis
Salsola collina
Salsola gobicola
Salsola tragus
Salsola ryanii
Salsola paulsenii
[not *S. kali*]

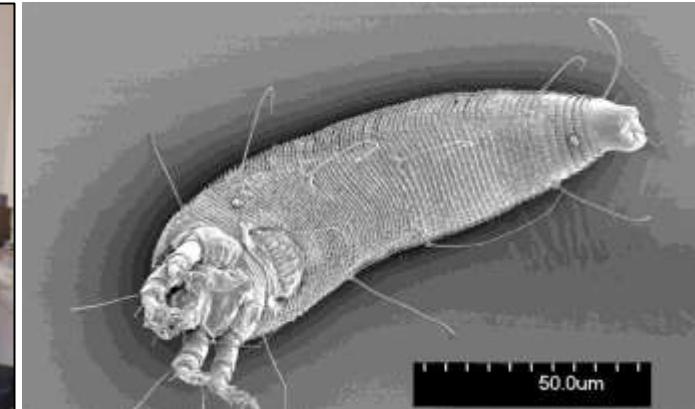
Hrusa & Gaskin. 2008.
Madroño 55(2) 113–131.

Russian thistle (*Salsola tragus*)

Eriophyid mite *Aceria salsolae*



Established colony at EBCL
from Greece.



BBCA conducting field
host specificity test in
Italy.



L. Smith (EBCL)

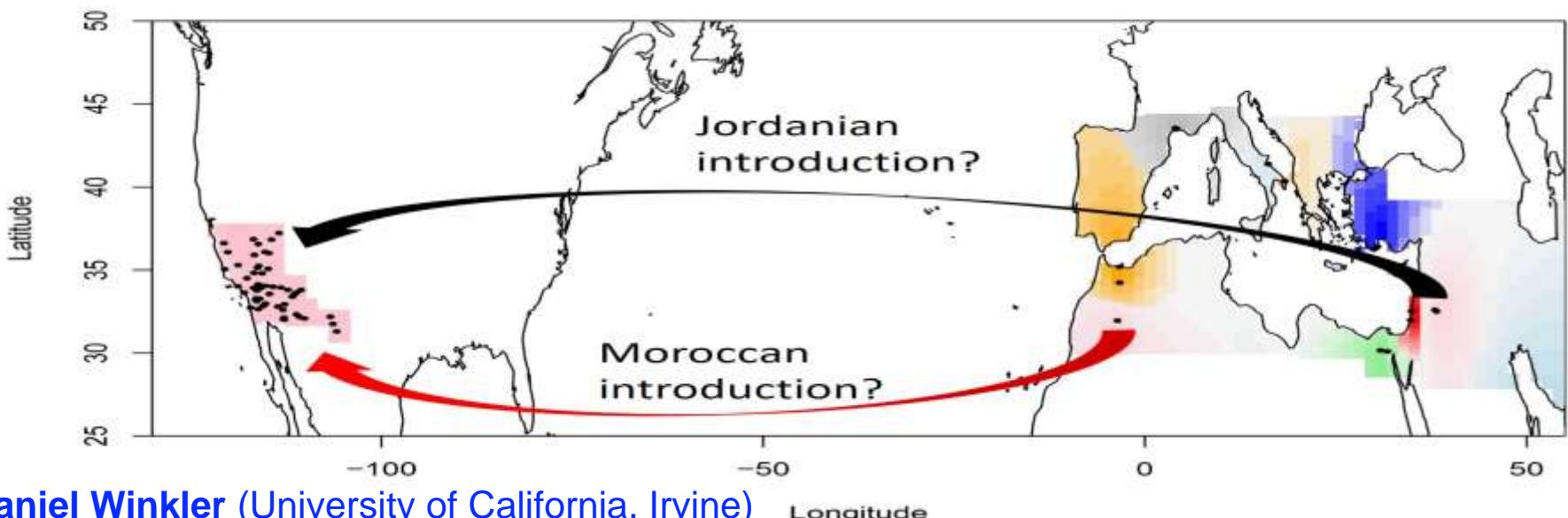
F. Marini, M. Crisotofaro (BBCA)



Sahara mustard (*Brassica tournefortii*)



- ✓ first identified in 1927 in the Coachella Valley, California
- ✓ It is believed that the species was accidentally introduced with the importation of date palms from the Middle East
- ✓ Likely origin from Morocco or Jordan (ddRADseq)



EBCL scientists



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Gundersen-Rindal
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Marie-Claude Bon
mol. genetics
Insects leader



René Sforza
entomology
Weeds leader



Franck Hérard
Entomology
Retired 12/17



[vacant]
entomology



Gaylord Desurmont
quarantine / entomology
(chemical ecology)



Mélanie Tannières
microbiology

Thessaloniki
Greece

Javid Kashefi
exploration



Alexandra
Chaskopoulou
mosquitoes &
sand flies

