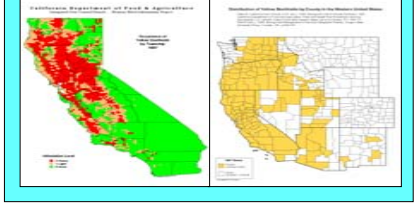
Biological Control of Yellow Starthistle: New prospects for an old problem

Lincoln Smith[1], Massimo Cristofaro[2], Michael Pitcairn[3], William Bruckart[4], Dale Woods[3], Timothy Widmer[5], Dana Berner[4], Allison Drew[1],
[1]USDA-ARS, Albany, CA; [2]ENEA, Rome, Italy; [3]CDFA, Sacramento, CA; [4]USDA-ARS, Ft. Detrick MD; [5]USDA-ARS-EBCL Montpellier, France (lsmith@pw.usda.gov)

Yellow starthistle (YST) is an alien plant that probably originated in the eastern Mediterranean. It was first collected in California in 1869, and now infests 42% of the state's townships. It diminishes the value of rangeland for grazing and recreation, elevates the risk of wildfire displaces native species, and is toxic to horses.

This weed is much less invasive in its land of origin, presumably because natural enemies, such as insects, plant diseases, animals or competing plants, help to keep it under natural control. We are exploring for insects and pathogens that attack this plant. Prospective agents are tested for host specificity to make sure they do not attack other plants. After evaluation and approval by state and federal agencies, these agents will be released to try to reestablish the natural control that occurs in the land of origin.

Distribution of Yellow Starthistle



Six species of insect biological control agents have been introduced to control yellow starthistle. All six attack the seedheads. The most widespread agents are the false peacock fly (*Chaetorellia succinea*) and the hairy weevil (*Eustenopus villosus*). Though the agents have established throughout California, their efficacy is not yet known.

Urophora sirunaseva

Bangasternus orientalis

Chaetorellia succinea

Eustenopus villosus

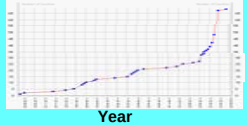
Larinus curtus

Status of Biological Control Agents

Biological control agent	Common name	First release	Status
Urophora jaculata		1969	Never established in USA.
Urophora sirunaseva	YST[1] gall fly	1984	Widely established, present at most YST infestations in CA & OR; a few sites in WA, ID.
Bangasternus orientalis	YST bud weevil	1985	Widespread in CA, OR, WA & ID.
Chaetorellia australis	YST peacock fly	1988	Prefers bachelor button; established at a few sites in CA; widespread in OR, WA, ID.
Eustenopus villosus	YST hairy weevil	1990	Well established in CA; widespread in OR, WA; a few sites in ID, UT. Very abundant.
Larinus curtus	YST flower weevil	1992	Established at a few sites in CA, WA, ID; widespread in OR.
Unapproved accidental introduction:			
Chaetorellia succinea	YST false peacock fly	1991	Widely established in CA & OR, and spreading into WA, ID & NV. Has been evaluated for nontarget impacts. Very abundant.

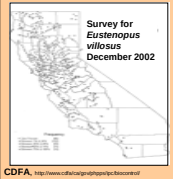
1 YST = yellow starthistle

Spread of Yellow Starthistle in the Pacific Northwest



INVADERS Database System, http://invader.dbs.umt.edu

Distribution of *Eustenopus villosus*



CDFA, http://www.cdfa.ca.gov/phpps/pcs/biocontrol

Yellow Starthistle is an annual that reproduces and spreads only by seed. Because the seedhead seemed a promising target, all previously-released biological control agents were seedhead-feeding insects. Several introduced insects are now widespread; however, they have not reduced plant densities to acceptable levels at most locations. A new agent, a rust pathogen, was first released in July 2003. Foreign exploration has been expanded in Turkey and southern Russia to search for new agents that attack other parts of the plant. New prospects include several newly described species. Two new agents are being evaluated at the Albany quarantine facility to insure that they will be both safe and effective. Other agents are being evaluated by our overseas collaborators. The diversity of prospective agents greatly increases our chances of finding some that are suitably host specific and sufficiently damaging to reduce yellow starthistle populations to innocuous levels in the U.S.

Rust pathogen (*Puccinia jaceae* var. *solstitialis*) first released July 2003 by CDFA and ARS scientists

B. Bruckart (USDA-ARS, Frederick, MD) and D. Woods (CDFA)

20 experimental field releases in 2004.

Flea beetle (*Psylliodes* sp. nr. *chalcomera*) from s. Russia

New cryptic species discovered; passed preliminary host specificity tests; additional testing underway.

M. Cristofaro (ENEA, Rome, Italy), M. Dolgovskaya (Russian Academy of Sciences, St. Petersburg), and P. Audisio (U. Rome, Italy)

Root crown weevil (*Ceratapion basicorne*) from Turkey develops in rosette

Testing safety for nontarget plants in quarantine lab and foreign field tests has shown it to be safe with respect to crops such as artichoke and safflower and to related native species.

Many larvae can develop in one root

This weevil is abundant in the field, attacking up to 100% of plants at a site.

L. Smith (ARS, Albany, CA), M. Cristofaro (ENEA, Italy), R. Hayat (Ataturk U., Turkey), B. Rector (ARS, France).

Several other prospective agents are in early stages of evaluation, including a blister mite, a rosette fly, a lace bug, a seedhead weevil, and five fungal pathogens.

Blister mite, *Aceria solstitialis*, **from Turkey.**
Newly described species likely to be very host-specific.
Preliminary tests conducted by J. Littlefield (Montana State U., Bozeman).

Rosette fly, *Botanophila turcica*, **from Greece.**
Larvae attack rosette buds during winter.
Preliminary studies by J. Kashefi (ARS, Greece) and B. Rector (USDA-ARS, France).

Seedhead weevil, *Larinus filiformis*, **from Turkey.**
Very abundant & active in late season.
L. Grüwaldt (Ataturk U., Turkey).

Lace bug, *Tingis grisea*, **from Turkey.**
Known only from yellow starthistle.
Preliminary studies by M. Cristofaro (BBCA, Italy).

Plant pathogens being evaluated:
Phoma exigua, *Synchytrium solstitiale*, *Streptomyces griseus*, *Cladosporium herbarium*, *Cercosporella* sp.
T. Widmer (USDA-ARS, France), D. Berner (USDA-ARS, Ft. Detrick)