

Biological Pest Control Harms Natives

In theory, biological pest control is a clean and green technology, friendly to the environment and to the farmer alike. In place of a manufactured pesticide, a natural enemy attacks the pest, usually by eating it.

In practice, that's often how biological control works. The right control organism with a selective appetite can generally disperse itself and suppress damaging populations of a weed or a crop-feeding insect, even on a large scale (SN: 7/26/97, p. 56).

Yet ecologists have worried about what the numerous new control organisms may be doing to native plants and insects. Control organisms, which typically come from other parts of the world, have traditionally been screened primarily for their impact on agriculture. The landscape is littered with reminders—from the gypsy moth to kudzu and purple loosestrife—that organisms let loose in new environments can turn into menacing invaders.

Now, Svata M. Louda of the University of Nebraska in Lincoln and her colleagues have documented what ecologists have been warning about. They found that a

weevil imported to control exotic weeds has been attacking native plants—to the point where extinction threatens.

The possibility of such effects has been known, but Louda's work "is the most complete assessment of nontarget effects in biological control to date," says ecologist Peter B. McEvoy of Oregon State University in Corvallis. Her data fill a void, he adds, in a hotly debated issue.

Louda reported the findings this week at the Ecological Society of America meeting in Albuquerque, N.M.

She and her coworkers happened upon the weevil and its effects unexpectedly. As an ecologist, Louda studies the long-term dynamics of native plants and insects at two prairie reserves in the Nebraska sandhills.

In 1993, the researchers were surprised to find a new insect they had not seen in their previous 9 years of monitoring the prairies. A handful of the insects turned up on native thistles, whose large seed heads are food for goldfinches and other creatures. One of the plants, the Platte thistle (*Cirsium canescens*), is unique to the sandhills.

The insect did not disappear. "In 1994, we started getting 20 instead of 3. Then in 1995, we got hundreds of them," Louda recalls.

Curious about the newcomer, they had the insect identified. It turned out to be the flowerhead weevil (*Rhinocyllus conicus*), a European species imported by the U.S. Department of Agriculture to control European weed thistles in pasture and rangelands. Louda says it was released in Nebraska in 1972. None of its target thistles grows on the prairie sites.

"In 1996, the numbers went up even more," says Louda. At that point, the researchers' curiosity turned to concern, and they reanalyzed their monitoring data. "We found exponential growth of this weevil on the Platte thistle at both sites."

The weevil is not just an innocent bystander, says Louda. "There's a significant impact on seed production," a decrease of about 80 percent. In earlier work, Louda says, she has shown how such decreases have dire consequences for the thistle population.

"The thing that really hit me hard here was the magnitude of the effect," says Louda. Given its only habitat is the sandhills, the Platte thistle could be facing extinction, she says. A related plant in the Great Lakes region, pitcher's thistle (*Cirsium pitcheri*), is already on the federal endangered species list and could be at greater risk if the weevil expands its range.

Louda has found that a native insect—a pictured wing fly—that feeds on thistle seeds has been affected as well. "Its population on the Platte thistle crashed at the same time that the weevils increased."

Ray Carruthers, who oversees the Agricultural Research Service's biological control program in Beltsville, Md., says the agency does screen control organisms to avoid unwanted ecological effects. "There are always some side effects" of any form of pest control, he notes, but the benefits may be worth it.

The weed thistles, says P. Charles Quimby Jr. of the USDA in Sidney, Mont., can overwhelm native species. "If you've ever seen a stand of musk thistle, you have no biodiversity there."

Louda says such dense invasions are rare. Both she and McEvoy think the weevil, which was known to feed on a wide range of thistles, should not have been released in the first place and that there is much room for improving other biological control programs.

"Biocontrol can work," says Louda, "but we have to be more judicious about the selection of agents that are released."

—C.Mlot

Top Othello player loses to computer

Add Othello to the list of games that computers can play at the world champion level. Last week, the computer program Logistello soundly defeated the top-ranked human player, winning six out of six games.

A modern variant of a 19th-century game known as Reversi, Othello is played on an eight-by-eight square board with disks that are colored black on one side and white on the other. Players take turns placing a disk of their color on an unoccupied spot. Each player aims to trap an unbroken line (horizontal, vertical, or diagonal) of the opponent's disks between two disks of his or her own. The trapped pieces are then flipped over and belong to the player who just moved. The winner is the player with the most disks on the board at the end of the game.

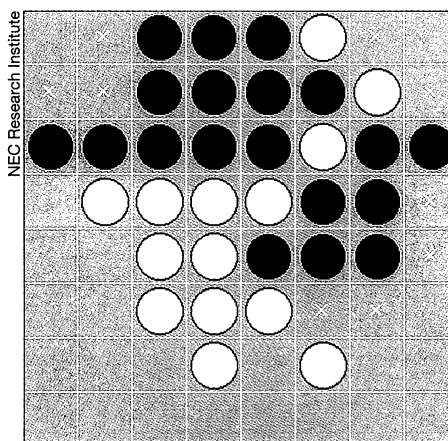
Othello has long attracted attention because its rules are simple, yet it can take years to master the game. Those features have also fascinated computer programmers (SN: 8/2/97, p. 76). Logistello was developed by Michael Buro, now at the NEC Research Institute in Princeton, N.J.

Running on a Pentium-based desktop computer, Logistello can check about 160,000 disk arrangements per second in

the middle of a game, allowing it to look ahead roughly 10 moves in order to find the best possible disk placement. The program also generates its own strategies, especially for determining the best sequence of moves at the beginning of a game, by playing against itself and analyzing millions of positions.

In last week's match, Logistello defeated world champion Takeshi Murakami, a teacher of English in Tokyo.

—I. Peterson



Othello game board as displayed by Logistello (x's indicate potential moves).