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**1998 Western Washington Pheromone Trap Delimiting Survey for Carnation Tortrix, *Cacoecimorpha pronubana* (Hübner)**

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**BACKGROUND**

The carnation tortrix (CNT), *Cacoecimorpha pronubana* (Hbn.) (Lepidoptera: Tortricidae) is an exotic defoliating pest moth first documented in North America in the Portland, Oregon, area in 1964 (Powell, 1969). Specimens of CNT in the WSU James Museum, reared from photinia in the Seattle, Washington, area in 1974 are the first records from this state. It has been periodically found on greenhouse crops in Oregon, but never in large, economically damaging populations (Obermeier, pers. com. 1997). Other than these collections and regional observations, no documentation exists and little is known regarding the distribution, impacts, or biology of CNT in Washington State.

Native to Northern Africa, CNT has become an economic pest of many commercial crops in Europe since its introduction there early this century. CNT larvae feed on a very wide range of host plants, including many ornamental plants, fruit trees, vegetables, and coniferous trees. In Europe, it is a serious economic pest of several crops grown in greenhouses, where it may produce more than five generations a year, and is a potentially serious threat to soft-fruit (EPPO, 1979 and Alford, 1984).

This survey was prompted by recent verbal reports and observations which may indicate changes in the prevalence of CNT in the region, including:

- Observations of “swarming” adult CNT in Western Washington by WSDA field staff (1997-1998),
- Increasing non-target collections of CNT adults in WSDA pheromone trap surveys (1996-1998),
- Report of CNT becoming a significant and unrecognized pest of raspberries in the Portland area (Tanigoshi, pers. com. 1998)

Adult CNT are distinctive little moths with bright orange hind wings in both sexes. Male wingspan is  $\frac{3}{4}$ ”, female is 1”. Mature larvae are about 1”, and have dark markings on the plate (behind head).

Figure 1. Adult Male Carnation Tortrix



Figure 2. Adult Female Carnation Tortrix



Figures 3 – 5. Carnation Tortrix Larvae



**1998 SURVEY OBJECTIVE**

Delimit the distribution of CNT in Western Washington and collect data on relative abundance and adult phenology using a CNT-specific pheromone lure.

**METHODS**

Pheromone lure baited traps were placed in all counties along the I-5 corridor, from near the Canadian border south to the Oregon border in western Washington. Traps were hung in roadside or residential yard fruit trees, primarily apple and cherry, and inspected approximately every two weeks from early June until late August.

Pherocon 2® type traps (a.k.a. "diamond" traps) were used, baited with pheromone lures provided by the USDA APHIS Otis Methods Development Center. The CNT pheromone lures were changed every two weeks and consisted of gray rubber septa with the following pheromone components:

0.7350 mg Z,11-Tetradecenyl Acetate  
0.0022 mg E,11-Tetradecenyl Acetate  
0.0022 mg Z,9-Tetradecenyl Acetate  
0.2210 mg Z,11-Tetradecenol

**RESULTS**

Trap numbers and moth capture statistics from this survey are presented in Table 1.

Table 1. 1998 CNT Pheromone Trap Delimiting Survey, Trap Placement and Moth Catch Data

County	Total Number of Sites Surveyed	Number of CNT Catch Sites	Total CNT Caught	Average Number of CNT Caught at Positive Sites
Whatcom	49	2	6	3.0
Skagit	25	0	0	0.0
Snohomish	23	8	110	13.8
King	28	23	1,160	50.4
Pierce	23	23	507	22.0
Thurston	23	3	35	11.7
Clark	28	18	402	22.3

**DISCUSSION**

CNT was captured in almost all Western Washington counties surveyed, Skagit County being the only exception. These results suggest CNT occurs throughout the north/south I-5 corridor (Canada to Oregon) in Western Washington. In fact, the presence of CNT in the remaining "I-5 counties", (i.e. Cowlitz, Lewis, and Skagit) has been established by non-target collections of CNT in other WSDA pheromone-trap surveys (see figure 6).

The moth capture data varies greatly between counties, indicating a wide variation in population levels across the geographic area of this survey. These data, particularly the average number of moths caught per site in each county, suggest CNT is relatively abundant in the lower Puget Sound region and in Clark County, in Southwest Washington. The highest CNT catch numbers recorded occurred in the Kent/Auburn Valley (south of Seattle), around the port of Tacoma, and near the port of Vancouver. Over 100 adult male CNT were captured at individual sites in these areas. Whether these areas of higher population are related to separate introduction sites, abundance of varied (ornamental) host plants, or environmental factors is unknown.

As mentioned, CNT has been collected in traps with several other pheromone lures in WSDA surveys. A review of the survey/collection records in the WSDA Economic Insect Collection and Survey (EICES) database found 357 records for CNT since 1995, with a total count of 3,970 specimens from all surveys. Of this total, 193 records, with a specimen count of 1,779 moths, were captured as non-target specimens in pheromone trap surveys for other tortricid (leaf roller) pests. Collection methods and related catch numbers recorded for CNT in various WSDA surveys are:

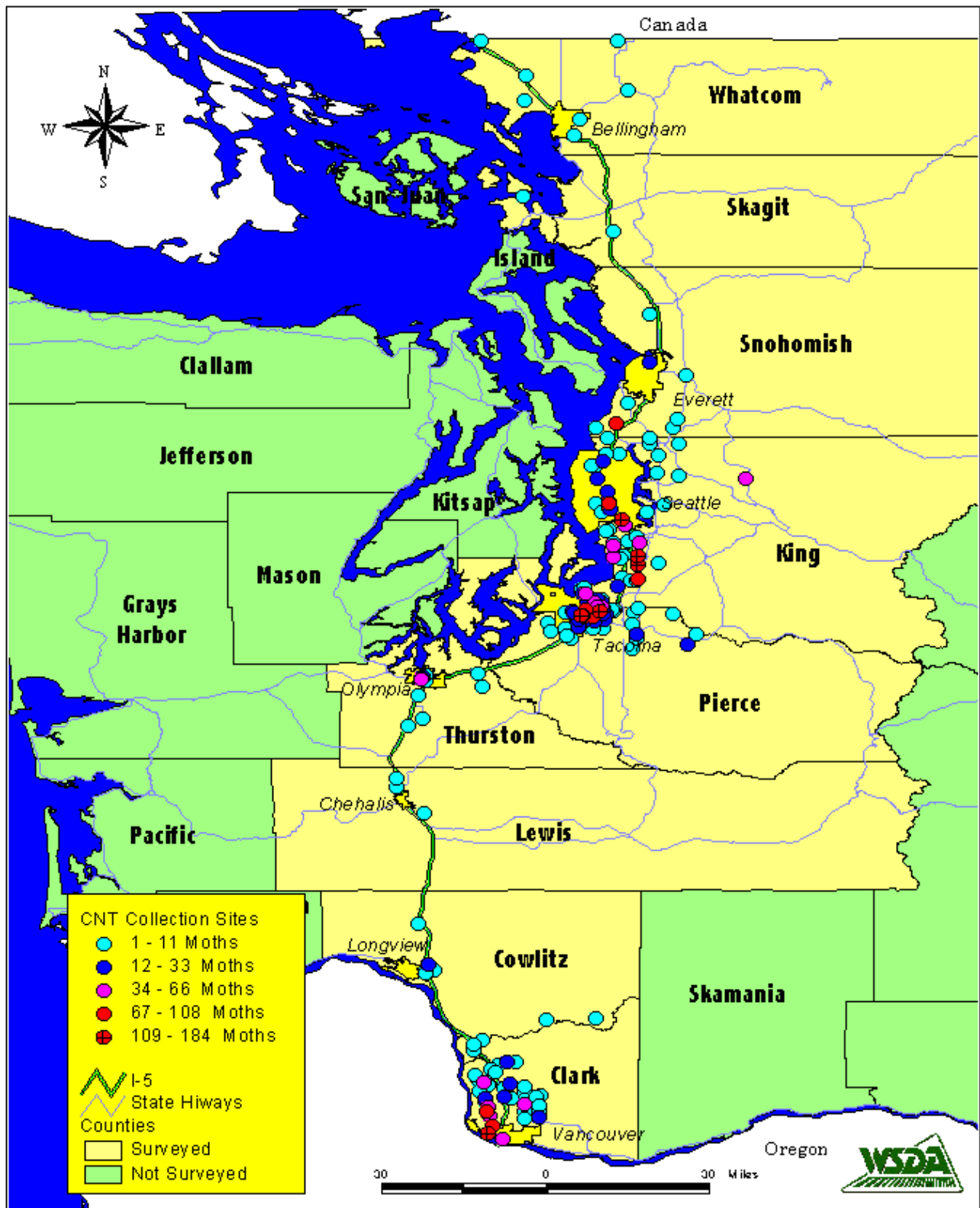
Pheromone Lure / Target Species	# Records	# Specimens	Ave. # / Rcd.
Carnation tortrix ( <i>Cacoecimorpha pronubana</i> ) lure	164	2,184	13.4
Straw-colored tortrix moth ( <i>Clepsis spectrana</i> ) lure	106	1,178	11.1
Dark fruit-tree tortrix ( <i>Pandemis heparana</i> ) lure	56	532	9.5
Summer fruit tortrix ( <i>Adoxophyes orana</i> ) lure	12	14	1.2
Others (including black light and hand collected)	16	24	-

The first three pheromone lures contain several similar components, although in different ratios, which is the case for lures for many tortricids (leafrollers).

DISCUSSION (Cont.)

All sites where CNT has been collected (by all WSDA survey methods) in Western Washington are presented in figure 6.

Figure 6. 1995 - 1998 Carnation Tortrix Collection Sites in Western Washington (in All WSDA Surveys)



While most collections of CNT in the rural / agricultural areas have been of relatively low numbers (compared to the urban areas) some isolated sites have produced higher catch numbers (eg. King county).

**DISCUSSION (Cont.)**

The consistent catch of CNT with pheromone lures for other tortricids in WSDA surveys suggests CNT may be collected in a wide range of pheromone traps for various leafroller pests of different crops. This behavior may help identify the presence of CNT if it becomes a pest of different crops in the Northwest as it did in Europe, achieving economic pest status after a latent period of decades following introduction.

Adult flight for CNT has been recorded from late-May to the end of September in Western Washington, although the European literature indicates flight may extend into November. Peak flight times have generally occurred in June and August, reflecting the two generations per year produced by CNT. However, catch data over the last three years also show flight timing is quite variable from year to year and location to location, and can occur throughout the summer without a clear peak at all. These trapping results also agree with European literature on CNT, which notes a consistent overlap of generations, which can produce extended, continuous adult flight.

Unlike most tortricid (leafroller) pests, CNT adults fly during the day, and moths in-flight can be identified by the bright orange coloration of the hind wings. The reported "swarming" behavior of adult moths has not been directly observed by the author, but can apparently be a dramatic event. These events have been reported in June and August from several settings in urban areas, and one WSDA employee hand-collected several adult male CNT as they flew into his open car window while stopped at a traffic light (in Clark County).

**CONCLUSIONS**

CNT is currently present in all populous Western Washington counties and locally abundant in some areas of King, Pierce, and Clark counties.

Due to annual variation in larval development and overlapping generations, adult moths may be found continuously, from spring to late fall, in Western Washington. The majority of adult flight, peak flights for the overwintering and summer generations, typically occurs during June and late-July / August.

Adult CNT are day-flying moths, easily identified by their distinctive bright orange hind wings.

**Pertinent Literature:**

EPPO (Anonymous), 1981. Data sheets on quarantine organisms, set 4, EPPO (European Plant Protection Organization) set A2. *Cacoecimorpha pronubana* Hübner. Lepidoptera: Tortricidae / (Mediterranean Carnation Leaf Roller). Bulletin de l'OEPP (France), 11: 1-6.

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Powell, J.A., 1969. Occurrence of *Cacoecimorpha pronubana* (Hbn.) in Oregon. The Pan-Pacific Entomologist, Vol. 45, No. 1: p.70.

Tanigoshi, L., 1998. Personal communication October 5. Director - WSU Vancouver Research Center.

**Distribution Note**

This report is provided as a public resource for the identification of carnation tortrix (*Cacoecimorpha pronubana*) in Western Washington State. This entire report, as well as individual graphic images, may be freely copied, distributed, and utilized in electronic and printed format as long as the content is not modified.

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