Bruce Spanworm, *Operophtera bruceata* (Hulst)
Winter Moth, *Operophtera brumata* (Linnaeus)
Lepidoptera: Geometridae

Pivnick, K. A.; Barton, D. L.; Millar, J. G.; Underhill, E. W. 1988. Improved pheromone trap exclusion of the Bruce spanworm *Operophtera bruceata* (Hulst) (Lepidoptera: Geometridae) when monitoring winter moth *Operophtera brumata* (L.) populations. Canadian Entomologist 120: 389-396.

Objectives: To improve the exclusion of *O. bruceata* from pheromone traps baited for *O. brumata* through the addition of an inhibitor for *O. bruceata*.

Abstract: Winter moth, *Operophtera brumata* (Linnaeus), is a significant defoliator of northern red oak, *Quercus rubra* L., in Nova Scotia where it was introduced accidentally in 1930. The range of *O. brumata* has expanded to include most of eastern Canada, portions of the northeastern US, and western Canada. Adults of *O. brumata* and the related Bruce spanworm, *Operophtera bruceata* (Hulst), are similar morphologically. *Operophtera bruceata* (Hulst), is a major defoliator of maple (*Acer* spp.), aspen (*Populus* spp.), and *Prunus* spp. throughout Canada. The sex pheromone of *O. brumata*, (*Z,Z,Z*)-1,3,6,9-nonadecatetraene (1,3*Z*,6*Z*,9*Z*-19:H), also attracts male *O. bruceata*. The two species are nearly identical in appearance and require examination of the genitalia for proper identification. Both species are pests and monitoring each population is of importance.

The addition of (*E,Z,Z*)-1,3,6,6-nonadecatetraene (1,3*E*,6*Z*,9*Z*-19:H) inhibits the attraction of *O. bruceata* to pheromone traps (Underhill et al. 1987). The discovery of the inhibitor 1,3*E*,6*Z*,9*Z*-19:H facilitates the identification and separation of *O. bruceata* and *O. brumata* populations, but traps baited with 1,3*Z*,6*Z*,9*Z*-19:H and 1,3*E*,6*Z*,9*Z*-19:H still capture a certain percentage of *O. bruceata*. Placement of the inhibitor inside the trap reduced capture of *O. bruceata* by 82% while placement of the inhibitor outside the trap reduced capture of *O. bruceata* by 97%. Contact with the inhibitor did reduce capture of *O. brumata*, signaling the need for careful placement of the inhibitor on the exterior of the trap. Research suggests that hybridization between *O. brumata* and *O. bruceata* does occur in areas where both species are present. The response of hybrid *O. brumata* x *bruceata* appears to be intermediate between the two species.

Sampling Procedure: Load 100 µg of a 1% solution of 1,3*Z*,6*Z*,9*Z*-19:H in hexane on rubber septa. Load 50 µg of a 1% solution of 1,3*E*,6*Z*,9*Z*-19:H in hexane on rubber septa. To each septum loaded with either the sex pheromone or the inhibitor, add 1–2 drops of both hexane and 10% butylated hydroxytoluene in acetone as an antioxidant. Place a septum loaded with 1,3*Z*,6*Z*,9*Z*-19:H inside each Hara trap, along with a trip of insecticide to kill attracted moths. Cover both ends of the trap, except for the entrance holes, with fiberglass mesh (1.5-mm mesh) to prevent predators from scavenging moths from the traps. Place 4 septa loaded with 1,3*E*,6*Z*,9*Z*-19:H on the exterior of each trap, with one septa placed above and one

below the two entrance holes. Install traps about 1.5 m above ground and set at least 5 m apart in stands of host trees. Traps should be installed before the adult flight period in the fall.

Notes: Trapped moths can be identified to species using characteristics of the adult genitalia (Eidt et al. 1966; Fitzpatrick et al. 1991). Hybrid *O. brumata* x *bruceata* will be inhibited by 1,3*E*,6*Z*,9*Z*-19:H to a lesser extent than *O. bruceata*, but more so than *O. brumata*.

References:

Eidt, D. C.; Embree, D. G.; Smith, C. C. 1966. Distinguishing adults of the winter moth, *Operophtera brumata* (L.), and Bruce spanworm, *Operophtera bruceata* (Hulst) (Lepidoptera: Geometridae). Canadian Entomologist 98: 258-261.

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Underhill, E. W.; Millar, J. G.; Ring, R. A.; Wong, J. W.; Barton, D.; Giblin, M. 1987. Use of a sex attractant and an inhibitor for monitoring winter moth and Bruce spanworm populations. Journal of Chemical Ecology 13: 1319-1330.