

Intercept™ Panel Trap modified for monitoring forest Cerambycidae

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ABSTRACT: The Intercept™ Panel Trap, was modified and field tested for enhanced monitoring of forest Coleoptera, and especially for family Cerambycidae. The trap is made from corrugated plastic. It is light-weight, water proof, and durable. Field experiments measured capture of forest Cerambycidae in five different prototypes of Intercept Panel Trap and in Phero-Tech 12-unit Multi-funnel Trap. Captures of longhorn beetles were significantly higher in two modifications of the new prototype of the Intercept Panel Trap than in the old version of the trap or the Funnel Trap. The best performance of the Intercept Panel Trap for monitoring longhorn beetles was achieved by using: (1) trap with 5 cm hole in the collecting funnel, (2) wet-cup option of collection cup, and (3) increased slipperiness of the trap surfaces.

HISTORY

In 1996 Philipp Kirsch, the owner of IPM Technologies and entomologist, initiated the construction of the Intercept Panel Trap. Mr. Kirsch invited into cooperation Dr. Darrell Ross from Department of Forestry of Oregon State University in Corvallis, Oregon and Dr. Gary Daterman from United States Forest Service in Corvallis, Oregon. In the period of 1996–1998 several prototypes and modifications of the trap has been built and evaluated. These prototypes had cylindrical shape with large ventilation holes located across entire trap surface. Although trap showed initial promises for capturing bark beetles, its performance did not meet expectations of the designers. In 1998 Dr. Darek Czokajlo joined the IPM Technologies and took over trap design, built, and manufacturing. In the spring of 1999, with ongoing cooperation from Drs. Ross and Daterman and IPM Technologies' staff, IPM Technologies commercially launched first prototype of the Intercept Panel Trap (Fig. 1). In 1999–2000 the trap has been tested at several different locations throughout United States and Canada for spruce beetle (*Dendroctonus rufipennis*), Douglas fir beetle (*D. pseudotsugae*), Western pine beetle (*D. brevicornis*), Western balsam bark beetle (*Dryocetes confusus*), larger pine shoot beetle (*Tomicus piniperda*) (Fig. 3), pine sawyers (*Monochamus* spp.), Buprestid beetles (Fig. 4), pine bark beetles (*Ips* spp.), wood wasps and several other exotic forest pests, and in China for Asian longhorn beetle (*Anaplo-*

phora glabripennis). This trap prototype already met IPM Technologies expectations toward its field performance. However, the company has been searching for a trap that would effectively capture longhorn beetle. In 2000, some features of the trap have been modified. The bulky body of the previous trap prototype has been replaced with light, two-panel part (Fig. 2). In addition, IPM Technologies has been looking at other modifications such as enlarging hole size in the collecting funnel that is immediately

Intercept Panel Trap

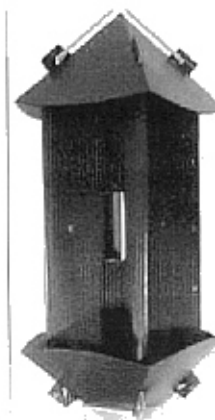


Fig. 1. Old prototype

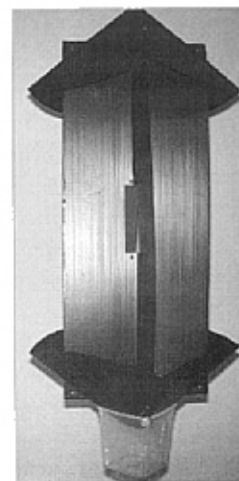


Fig. 2. New prototype



connected to the collecting cup, use of the cup filled with water (wet-cup) instead of cup with the drain at its bottom, and add extra slipperiness to the body of the trap. The 2001 field assays demonstrated that increasing slip-

perness of the trap and using wet-cup option indeed increased longhorn beetle captures and significantly outperformed other trap prototypes and Lindgren Multi funnel trap (Figs. 5-7).

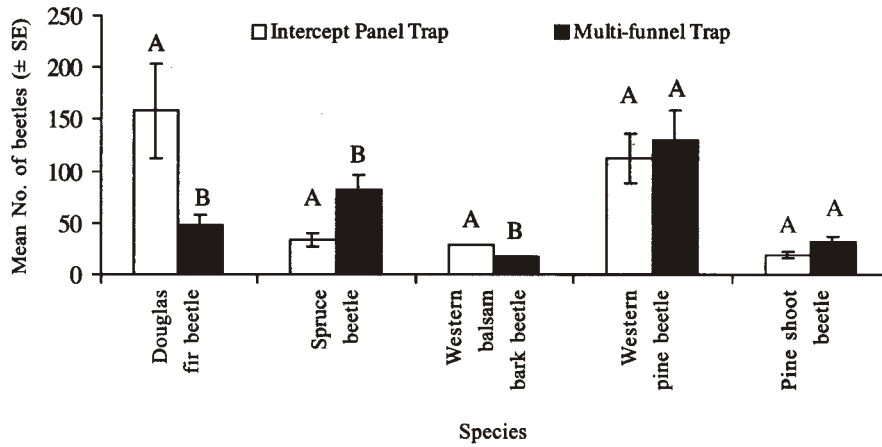


Fig 3. Trap catches of various bark beetles in Intercept Panel Trap and Lindgren Funnel Trap. Bars with the same species followed by the same letters are not significantly different (LSD test, $n = 5-10$, $P < 0.05$).

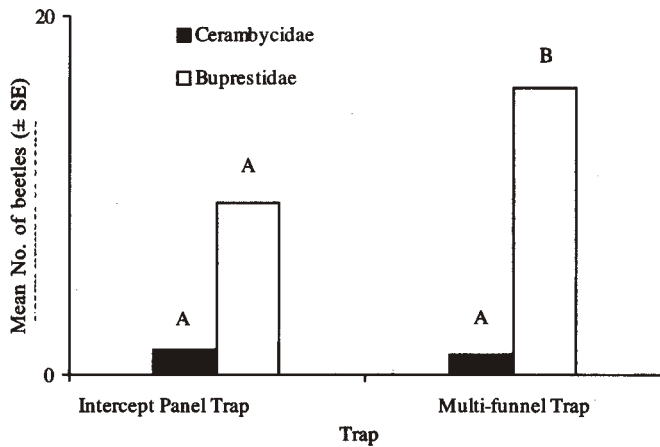


Fig. 4. Trap catches of Cerambycid and Buprestid beetle in Intercept Panel Trap vs. Multi-funnel Trap, near Barringer, 2000. Means within species followed by same letters are not significantly different (LSD test, $n = 10$, $P < 0.05$).

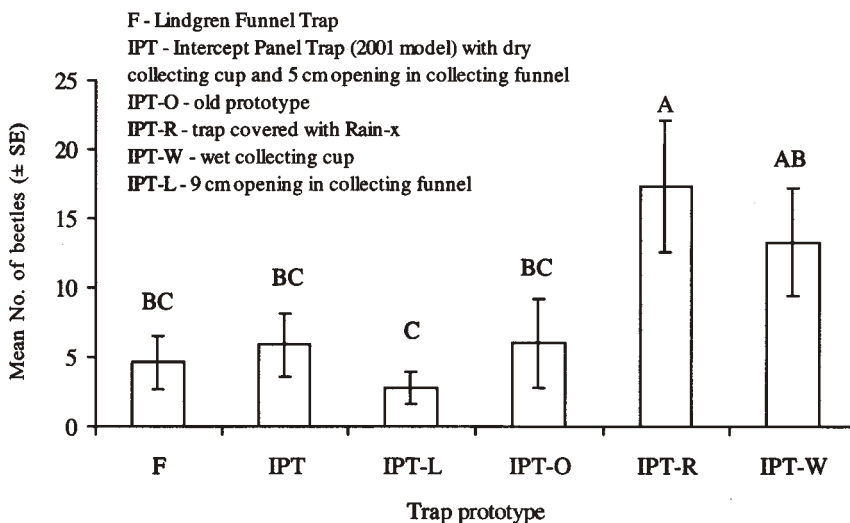


Fig. 5. Captures of longhorn beetle in various prototypes of Intercept Panel Trap and Lindgren Funnel Trap North Carolina, USA. Bars with the same letters are not significantly different (LSD test, $n = 5-10$, $P < 0.05$).

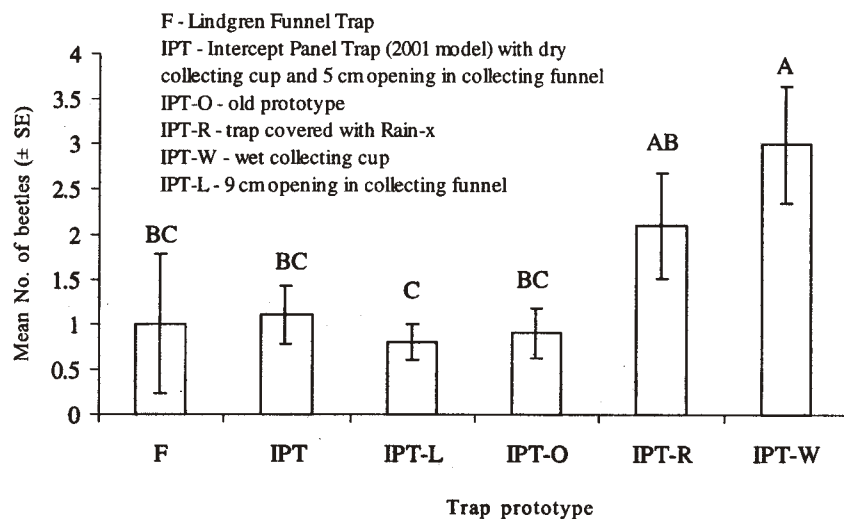


Fig. 6. Captures of longhorn beetles in various prototypes of Intercept Panel Trap and Lindgren Funnel Trap, Minnesota, USA. Bars with the same letters are not significantly different (LSD test, $n = 5-10$, $P < 0.05$)

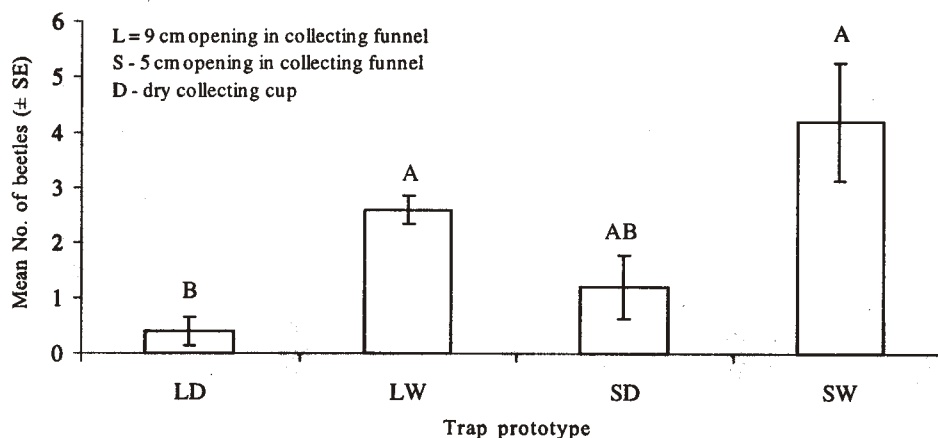


Fig. 7. Captures of longhorn beetles in four modifications of Intercept Panel Trap covered with Rain-x. Bars with the same letters are not significantly different (HSD test, $n = 5$, $P < 0.05$)

FEATURES

While simulating a tree of large diameter, the Intercept Panel Trap provides a large surface area to maximize trapping. The Intercept Panel Trap for bark beetles offers lightweight and durability. It is easy to assemble. The trap is water- and weather-resistant. The Intercept Panel Trap is easy to set up and fold for infield operations and occupies a minimal amount of space for of season storage when flattened.

RESULTS

Using previous prototype of the Intercept Panel Trap the trap catches of Douglas fir beetle and Western balsam bark beetle were significantly higher in the Panel Trap (Fig. 3). There was no significant difference between Panel and Funnel Traps in captures of Western pine beetle, larger pine shoot beetle (Fig. 3) and Cerambycid beetles (Fig. 4). Captures of spruce beetle (Fig. 3) and Buprestid beetles (Fig. 4) were significantly higher in the Funnel Traps compared with the Panel Trap.

The trap captures of longhorn beetles were significantly higher in two modifications on the new prototype of the Intercept Panel Trap than in unmodified old and new version of the trap, and then in Lindgren Funnel Trap.

The trap captures were enhanced by 1. increased slipperiness of trap body and 2. using collecting cup filled with water (Figs. 5 and 6). The modifications such as previous trap prototype or enlarged hole in the collecting funnel did not have any influence on trap performance (Figs. 5 and 6). Finally, the best performance of the Intercept Panel Trap for monitoring longhorn beetles was achieved by using: 1. trap with regular 5 cm hole in the collecting funnel, 2. wet-cup option of collecting cup, and 3. body trap with increased slipperiness of surface (Fig. 7).

DISCUSSION

The Intercept Panel Trap is an effective tool for monitoring Cerambycids, as well as Scolytids, Buprestids, and other forest Coleoptera and Hymenoptera. The new modifications to the trap substantially increased trap captures of longhorn beetles. Panel traps were very robust under rigorous field conditions, light-weight to carry, weather and water proof, and easy to install. Intercept Panel Trap outperformed Lindgren Funnel Trap for most tested insect species. Panel traps disassemble rapidly, can be stored flat, and use less storage space than Funnel traps. The Intercept Panel Trap is now commercially available and is first commercially available and effective trap for the Cerambycid beetles.

Intercept™ Panel Trap, a novel trap for monitoring forest Coleoptera

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ABSTRACT: A novel trap, the Intercept™ Panel Trap, was developed and field tested for monitoring forest Coleoptera. The trap is made from corrugated plastic. It is light-weight, water proof, and durable. Field experiments measured capture of several forest Coleoptera in comparison to the Phero-Tech 12-unit Multi-funnel Trap. Target species: spruce beetle (*Dendroctonus rufipennis*, Douglas fir beetle (*D. pseudotsugae*), Western balsam bark beetle (*Dryocetes confusus*), pine bark beetles, larger pine shoot beetle (*Tomicus piniperda*), pine sawyers (*Monochamus* spp.), Asian longhorn beetle (*Anaplophora glabripennis*), Buprestid beetles, wood wasps, and several other exotic forest pests. For most bark beetle species, the Intercept™ Panel Trap captured equivalent or higher numbers, except for spruce beetle and larger pine shoot beetle when compared to the Multi-funnel Trap. Intercept™ Panel Traps captured a substantial numbers of Cerambycid and Buprestid beetles, and Siricid wood wasps. In comparative tests in Oregon, the Intercept™ Panel Trap captured substantially more exotic forest pest species of greater diversity than the Multi-funnel Trap.

A novel trap, the Intercept Panel Trap, has been developed for monitoring forest Coleoptera. The trap is made from corrugated plastic. It is light weight, water proof, and durable. Trap efficacy in capturing several forest Coleoptera was meast in field trials in comparison to the Phero Tech 12-unit Multi-funnel Trap. Field trials targeted: spruce beetle (*Dendroctonus rufipennis*), Douglas fir beetle (*D. pseudotsugae*), Western pine beetle (*D. brevicomis*), Western balsam bark beetle (*Dryocetes confusus*), pine bark beetles (*Ips* spp.), larger pine shoot beetle (*To-*

micus piniperda), pine sawyers (*Monochamus* spp.), Asian longhorn beetle (*Anaplophora glabripennis*), Buprestid beetles, wood wasps and several other exotic forest pests.

OBJECTIVES

– To assess comparative trapping efficacy and field performance of the Intercept Panel Trap for multiple forest Coleoptera.

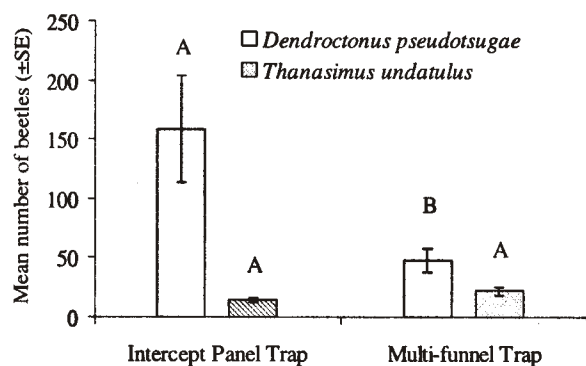


Fig. 1. Comparative trapping of *Dendroctonus pseudotsugae* and *Thanasimus undatulus* in Intercept Panel Trap vs. Multi-funnel Trap, Idaho Panhandle National Forest, Avery Ranger District, May 13–August 31, 1999

Means within species followed by same letters are not significantly different (HSD test, $n = 8$, $P < 0.05$)

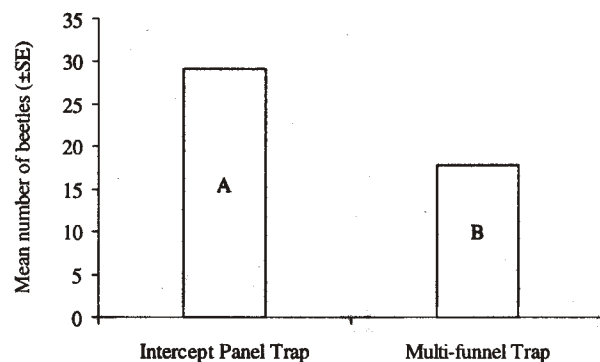


Fig. 2. Trapping comparison of *Dryocetes autographus* in Intercept Panel Trap vs. Multi-funnel Trap, Idixie National Forest, Logan, UT, July 1–September 7, 1999

Means followed by same letters are not significantly different (1-way ANOVA, $n = 5$, $P < 0.05$)

- To evaluate performance parameters and trap durability in diverse climates and environments.

MATERIAL AND METHODS

Field performance of Intercept Panel Trap was compared to Multi-funnel Trap baited with species -- specific pheromone lures in replicated paired trials.

RESULTS AND DISCUSSION

1. Trap catches of Douglas fir beetle and Western balsam bark beetle were significantly higher in the Panel Trap (Figs. 1, 2). There was no significant difference between Panel and Funnel Traps in captures of Western pine bee-

tle (Fig. 3), larger pine shoot beetle (Fig. 5) and Cerambycid beetles (Fig. 6). Captures of spruce beetle (Fig. 4) and Buprestid beetles (Fig. 6) were significantly higher in the Funnel Traps compared with the Panel Trap.

2. Panel Traps capture fewer non-target beneficial predators compared to Funnel Traps (Fig. 1).

3. The Intercept Panel Trap (Fig. 7) captured a substantial number of Cerambycid and Buprestid beetles, and Sirecid wood wasps. Trap captures of mountain pine beetle, *Ips* spp., exotics and wood wasps have not been processed and are not available. In proof of concept trials targeting surveillance of exotic forest pests in Oregon, the Intercept Funnel Trap captured substantially more insect species than the Multi-funnel Trap.

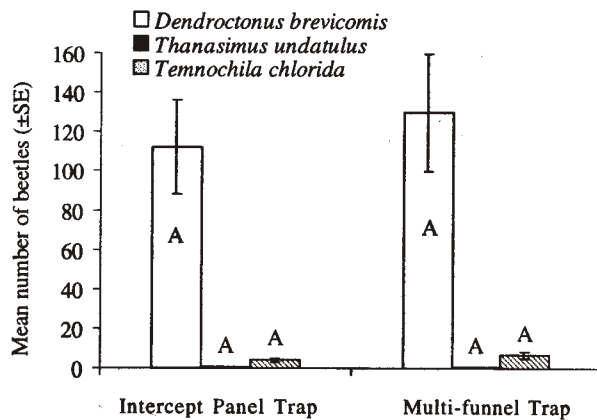


Fig. 3. Comparative trapping of *Dendroctonus brevicomis*, *Thanasimus undatulus*, and *Temnochila chlorida* in Intercept Panel Trap vs. Multi-funnel Trap, Idaho Panhandle National Forest, Avery Ranger District, May 20–September 7, 1999

Means within species are not significantly different (1-way ANOVA, $n = 5$, $P < 0.05$)

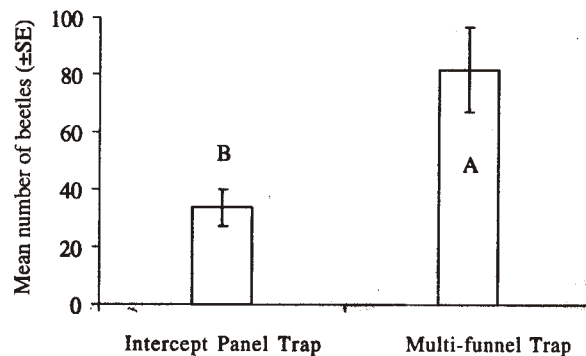


Fig. 4. Comparative trapping of *Dendroctonus rufipennis* in Intercept Panel Trap vs. Multi-funnel Trap, Dixie National Forest, UT, May 2–August 30, 1999

Means followed by same letters are not significantly different (HSD test, $n = 5$, $P < 0.05$)

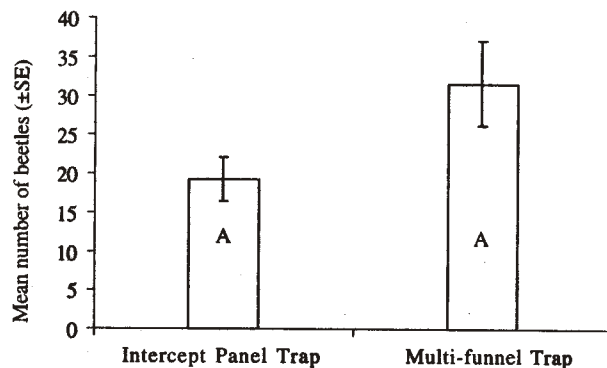


Fig. 5. Comparative trapping of *Tomiscus piniperda* in Intercept Panel Trap vs. Multi-funnel Trap, Barrie, ON, Canada, February 2000

Means are not significantly different (1-way ANOVA, $n = 5$, $P < 0.05$)

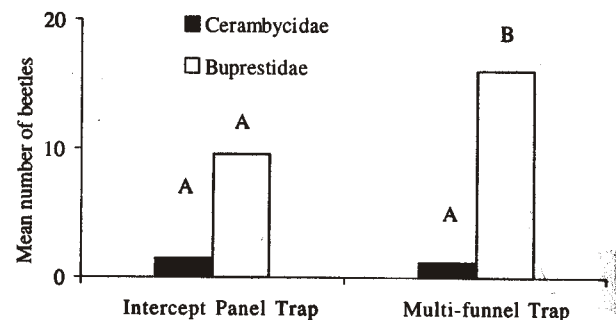


Fig. 6. Comparative trapping of beetles from families Cerambycidae and Buprestidae in Intercept Panel Trap vs. Multi-funnel Trap, near Barrie, ON, 2000

Means within species followed by same letters are not significantly different (LSD test, $n = 10$, $P < 0.05$)

CONCLUSIONS

The Intercept Panel Trap is an effective tool for monitoring Scolytids, Cerambycids, Buprestids, and other forest Coleoptera. Panel Traps were very robust under rigorous field conditions, light-weight to carry, weather and water proof, and easy to install. Panel Traps disassemble rapidly, can be stored flat, and use less storage space than Funnel Traps. The Intercept Panel Trap is now commercially available.

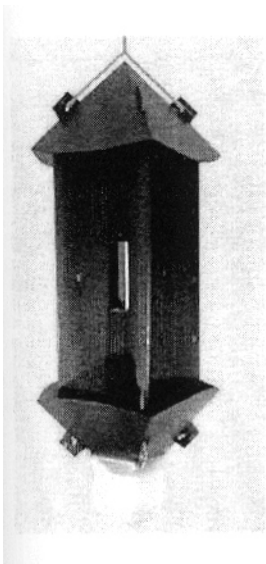


Fig. 7. Intercept Pranel Trap

Intercept™ Panel Trap (INT PT) Effective in Management of Forest Coleoptera

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INTRODUCTION

Trap efficacy in capturing economically important forest Coleoptera was measured in field trials comparing the Intercept Panel Trap (INT PT) with the Multi-Funnel Trap. The INT PT was designed to provide a better option for the monitoring of forest Coleoptera. The trap is made of corrugated plastic and is very robust under rigorous field conditions, but still lightweight, easy to carry, weather- and waterproof, and easy to install. The trap disassembles rapidly and stores flat, therefore requiring less storage space than Funnel Traps. The INT PT also costs significantly less than the Funnel Trap.



METHODS AND MATERIALS

Field trials were conducted on five sites within the United States: OR, NC, MN, WI, and NY. In OR, NC, MN, and NY three types of traps were tested: INT PT treated with Rain-X (INT PT-R), INT PT untreated (INT PT), and Multi-Funnel Trap (Phero Tech, Inc.). The traps were baited with three prototype lures: (1) standard lure (alpha-pinene (ap), ipsdienol(id), ipsenol (ie)), (2) turpentine lure (turpentine, id, ie), and (3) ethanol lure (ethanol, ap, id, ie). Five combinations of trap and lure determined the treatments: (A) INT PT-R + lure 1, (B) Funnel trap + lure 1, (C) INT PT + lure 1, (D) INT PT-R + lure 2, and (E) INT PT-R + lure 3. In WI, INT PT and Funnel Traps were both baited with lure 1. The wet-cup method was used, and captured insects were collected every 10 days.

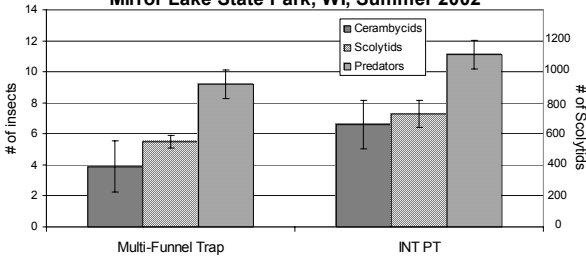
RESULTS

Data from captures in individual states are provided in the attached figures. The INT PT performed equal to or better than the Multi-Funnel Trap for Cerambycids and Scolytids. Captures of Buprestids were lower in the INT PT than in the Funnel Trap. The INT PT captured more bark beetles and consistently fewer predators than the Funnel Trap. The turpentine lure (2) caught equal or fewer numbers of beetles than the standard lure (1); The ethanol lure (3) caught more bark beetles than the standard lure (1).

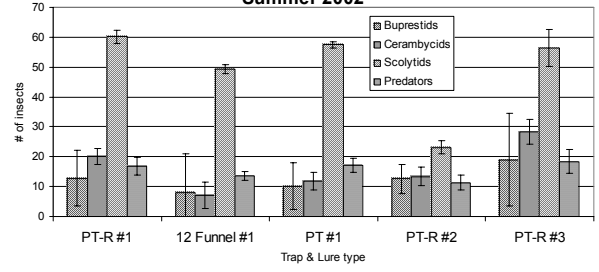
DISCUSSION

The Intercept Panel Trap is an effective tool for monitoring Cerambycids, as well as bark beetles, Buprestids, and other forest Coleoptera. It also captures fewer beneficial insects. The INT PT outperformed Phero Tech's Multi-Funnel Trap for most tested insect species. Higher beetle captures and increased detection capability in a less expensive trap equates to greater efficiency of forest pest monitoring programs. The Intercept Panel Trap is now commercially available.

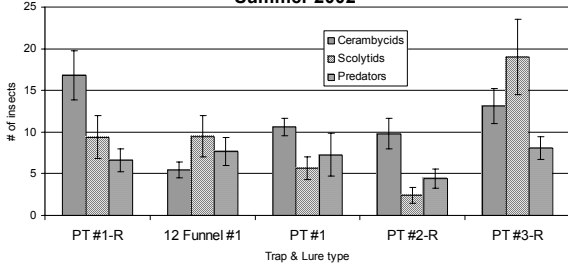
**Comparative Trapping of Forest Coleoptera,
INT PT and Multi-Funnel Trap,
Mirror Lake State Park, WI, Summer 2002**



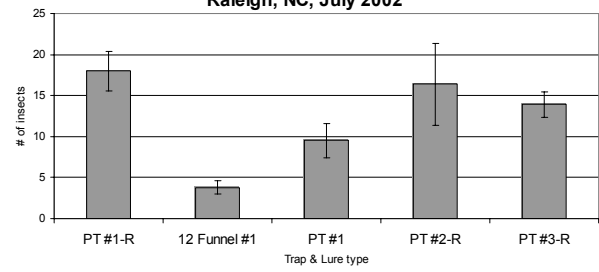
**Comparative Trapping of Forest Coleoptera,
INT PT and Multi-Funnel Trap, Duluth, MN,
Summer 2002**



**Comparative Trapping of Forest Coleoptera, INT PT
and Multi-Funnel Trap, Cranberry Lake, NY,
Summer 2002**



**Comparative Trapping of Cerambycids,
INT PT and Multi-Funnel Trap,
Raleigh, NC, July 2002**



**Comparative Trapping of Forest Coleoptera, INT PT and Multi-Funnel
Trap, Forest Grove, OR, Summer 2002**

