PROGRESS REPORT FOR THE NEW MEXICO PINK BOLLWORM, PECTINOPHORA GOSSYPIELLA (SAUNDERS), ERADICATION PROGRAM

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Abstract

The New Mexico Pink Bollworm Eradication program has made major strides toward complete eradication of this important pest. This program in New Mexico provides excellent data showing massive differences between adult populations, pre program in 2000 and 2001 compared to near absence in 2007. The detection of only 15 native moths with the last capture in early July is an indication of major accomplishment. The complete absence of a known larval population any where within the boundaries further supports the author's assessment of accomplishment. With diligent program execution this program is expected to reach its final goal.

Introduction

The fundamentals for pink bollworm (PBW) eradication documented by Osama El-Lissy et al in 2002 were based on numerous trials in California and Arizona (Staten et al 1999 and Antilla et al 1996). New Mexico's pink bollworm program was launched in 2002 after boll weevil populations reached near undetectable levels by the South Central New Mexico Cotton Boll Weevil Control Committee in 2002. The committee successfully conducted a referendum early in 2002 to initiate this program. Growers approved this extension of the Boll Weevil Foundation's activity by 60%.

Methods and Material

The framework for current pink bollworm eradication evolved from programmatic experience and field trials, as early as 1968, in Southern California and the San Joaquin valley in central California (Staten et al 1993). Osama El-Lissy et al (1997) placed this in the context now used for the expanded program from experience gained during conduct of the Texas boll weevil program. All activities are categorized within three classifications (Mapping, Trapping and Control), as generally described by Allen et al (2002).

Mapping

All fields are mapped each year as cotton is verified by field personal. It is critical that the program categorize cotton as Bt., non-Bt., and whether it is a Pima or upland variety. Identification of its states as organic or non-organic cotton is particularly important as the program encompasses an area with profitable organic Pima production.

The presence or absence of Bt. is verified using commercially available ELISA tests (AgDia Inc). All mapping is assisted using differentially corrected GPS technology (Trimble GPS units and Pathfinder Office software). Field maps are constructed with Map Info software. Fields can then be coded as needed by type and thematically for population analysis.

Trapping

The program uses the pink bollworm delta trap as a standard (Foster et al 1977) baited with a 4mg natural rubber septa. At the onset, New Mexico used 1 trap per 10 acres of cotton with all fields receiving at least 1 trap. With major reductions, density was reduced in 2007. In this year, all critical habitat in the Mesilla Valley received the 1:10 ratio on non-Bt cotton or 1 trap per field on Bt cotton. The smaller areas north of Las Cruces, Hatch and Deming trap numbers were reduced on Bt cotton to 1 per 40 acres with all isolated fields trapped singularly. Each trap location was given a unique barcode, which allowed the trap data to be electronically associated with its field

location. Traps were checked weekly. Before an area received sterile moth release, traps were replaced at least every 2 weeks with a new lure. With the onset of sterile release, traps must be replaced weekly so that determination of sterile and or native (non-sterile) status can accurately be made. Trap capture information, crop stage, and any other information deemed critical was recorded weekly using a scanner data logger.

Control

The New Mexico program used all control components of the program system in 2002 and 2003, except for release of sterile Insects (SIT). The first sterile releases were on a limited basis in The Deming, Hatch and North Las Cruces areas on a "test" basis in 2004. Full sterile release started in 2005 (Walters et al 2006). Cultural control followed state mandated standards and timely practices were encouraged. The program was in control of and conducted all pheromone and conventional insecticide treatments for PBW throughout the treatment area. Pheromone treatments utilized the PBW rope, and either the Scentry MEC or the Suterra Checkmate formulation as a ground or air applied formulation. The PBW rope formulation was used, but not as expected or found to be optimum in other areas. In both New Mexico and Texas, cultivation for weed control is rigorous and extensive. Cotton is normally planted on beds with shallow furrows. As the crop grows, a deep furrow is developed by cultivation systems which raise bed level extensively. A rope applied on plants at six-leaf stage is quickly buried as soil is thrown up on the bed. The program adapted quickly to a treatment system of first using a ground (preferred) or aerially applied sprayable pheromone treatment. Under high-risk situations, some dual treatments were used where a conventional pesticide and the pheromone were mixed. Rope was then applied as soon as plants were taller and it was logistically feasible. Rope was applied at 200 per acre and sprayable systems at 1 half full label rate or full rate. Lorsban or, as the program progressed, Lock-on R was the conventional pesticide of choice. Conventional pesticide alone or as a dual was only used where risk was deemed very high based on trap data or larval populations were found.

Results

A brief summary of acreage under this management is shown in Table 1 with key program statistics. Total acreage has been stable with a shift in ratio of non Bt to Bt cotton this last year. Organic cotton increased from 2002 to 2007. The location of all cotton is found in Figure 1 following text of this paper

Success of this program can be measured by consideration of two major parameters. The first major parameter is a decrease in need for pesticide of any form including pheromone. Figure 2 provides a measure of all sprayable pheromone used over the last four years in New Mexico. It is important to note that no sprayable pheromone treatments, excluding limited dual treatment, were used in this program over the last two years. Figure 3 provides information on dual treatments. No conventional pesticide was used by itself in the last four years. Because of the difficulty in controlling PBW with organically certified products, all organic cotton was treated with PBW rope throughout the duration of this program. Limited additional acreage was treated as natives were found in non-Bt cotton. This usage is shown in Figure 4.

Population assessment provides the second major assessment of success. Trap capture rates provide the most consistent measure of population suppression throughout the life of this program. The New Mexico program has trap data for the two years preceding eradication program initiation (2000 and 2001). This data is consistent in methodology with program monitoring throughout the program when the date is calculated on a per trap per week basis as in Figure 5. In this figure, the impact of the program is apparent in its totality, but differences in the last three years are obscured. Total season long capture levels bring this in focus in Figure 6. In considering this data, it is important to note that of the fifteen native moths captured in 2007 most, if not all, were likely spring emergence. The last moth was captured the week of July 7-14. No Native PBW moths were detected for the duration of the season.

Similar trends are apparent when program evaluation samples are examined. New Mexico maintained 40-41 random sample locations where were sampled for larvae during the principle boll set period. In 2003, two hundred twenty-seven larvae were found. In 2004, only two larvae were found. No larvae were found in this data set in 2005, 2006 or 2007. Most importantly, searches in historically hot locations where one would most expect to find PBW, have also not reviled larvae in the last two years. The last known larval populations were in very small plots where control by soft technology has the most difficulty.

Sterile release and its pertinent data for 2005 have been documented by Walters et al in detail. This full year of release was a year that basic systems for the entire area were set up. The starting target release rate in 2006 was at 12.0 million sterile moths per week using six release flights per week. The release level was adjusted upward to 13.5 million mid-season. In 2007, releases were held at 15.0 million per week season long. Releases started on or about May 7 and ended on. Figure 7 provides sterile recapture data for 2006 and 2007.

Conclusion

The New Mexico program is well on its way to completion. Intensive monitoring and continued sterile release are of particular importance.

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Table 1
SOUTH CENTRAL NEW MEXICO PROGRAM STATISTICS

	2002	2003	2004	2005	2006	2007
Bt acres	6,368	8,757	10,054	9,703	7,902	12,603
Pima acres	6,729	4,467	7,982	9,442	11,142	2,847
Non Bt acres	3,568	3,483	3,294	1,913	1,974	774
Organic Pima	396	353	370	664	606	733
Total acres	17,061	17,061	21,701	21,722	21,627	16,957
Traps	1,782	1,906	2,371	2,231	1,652	910

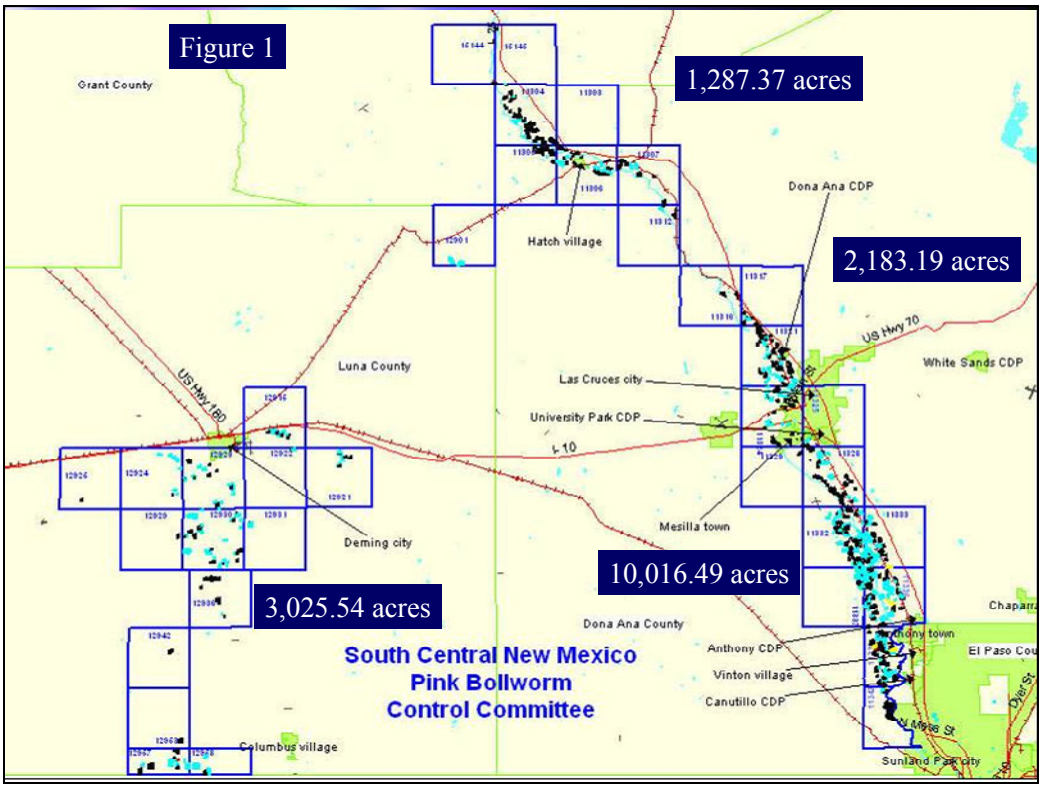
Figure 1
1,287.37 acres
2,183.19 acres
10,016.49 acres
3,025.54 acres
Grant County
Luna County
Dona Ana County
Hatch village
Las Cruces city
University Park CDP
Dona Ana CDP
White Sands CDP
Mesilla town
Deming city
Columbus village
Anthony CDP
Vinton village
Canutillo CDP
Sunland Park city
US Hwy 70
US Hwy 180
I-10
South Central New Mexico
Pink Bollworm
Control Committee

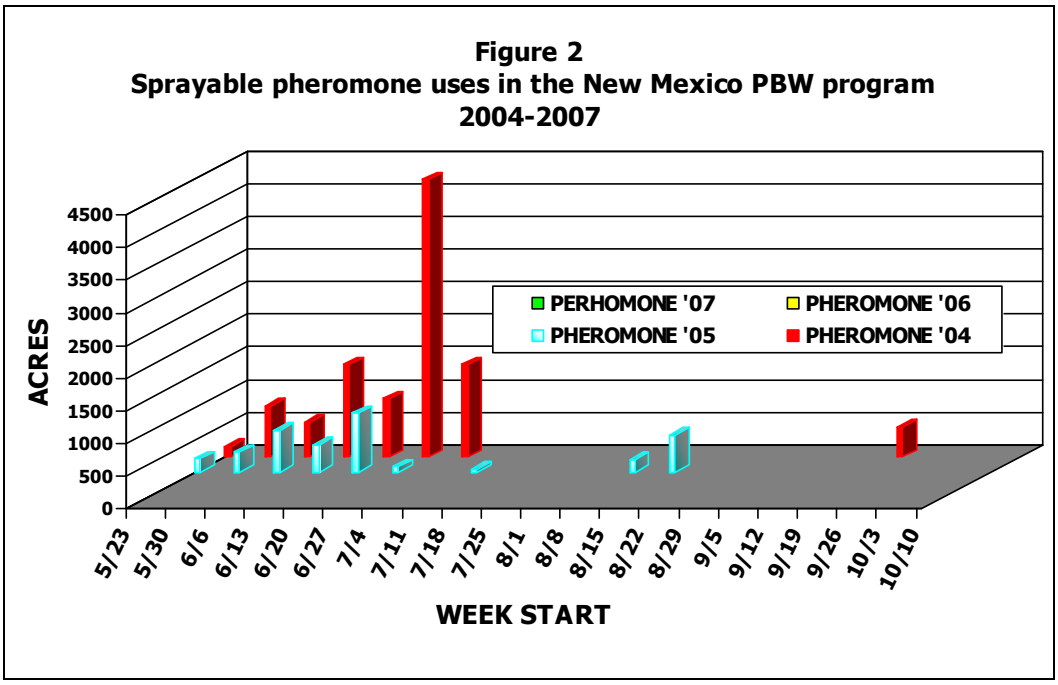
Figure 2
Sprayable pheromone uses in the New Mexico PBW program
2004-2007
ACRES
4500
4000
3500
3000
2500
2000
1500
1000
500
0
PERHOMONE '07
PHEROMONE '06
PHEROMONE '05
PHEROMONE '04
5/23
5/30
6/6
6/13
6/20
6/27
7/4
7/11
7/18
7/25
8/1
8/8
8/15
8/22
8/29
9/5
9/12
9/19
9/26
10/3
10/10
WEEK START

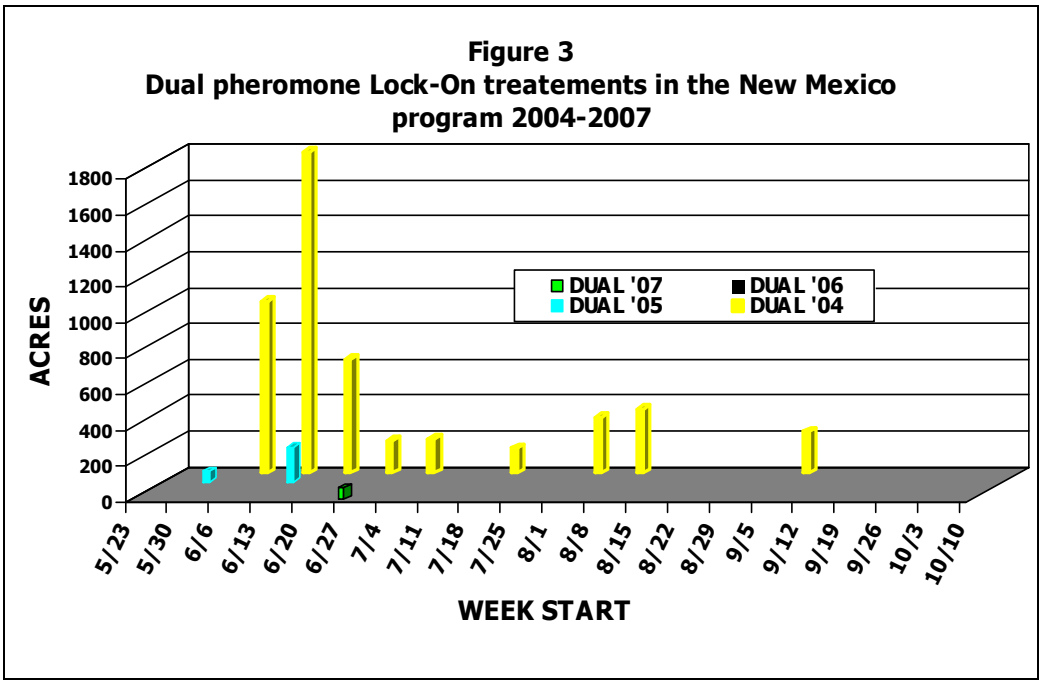
Figure 3
Dual pheromone Lock-On treatements in the New Mexico program 2004-2007
ACRES
1800
1600
1400
1200
1000
800
600
400
200
0
DUAL '07
DUAL '06
DUAL '05
DUAL '04
5/23
5/30
6/6
6/13
6/20
6/27
7/4
7/11
7/18
7/25
8/1
8/8
8/15
8/22
8/29
9/5
9/12
9/19
9/26
10/3
10/10
WEEK START

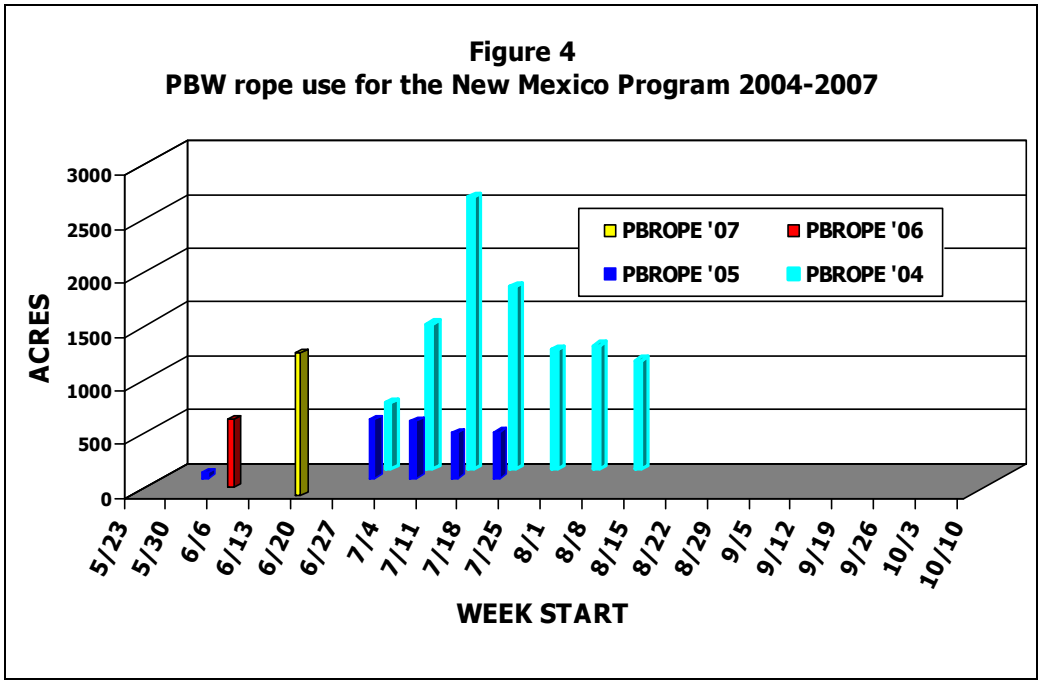
Figure 4
PBW rope use for the New Mexico Program 2004-2007
ACRES
3000
2500
2000
1500
1000
500
0
PBROPE '07
PBROPE '06
PBROPE '05
PBROPE '04
5/23
5/30
6/6
6/13
6/20
6/27
7/4
7/11
7/18
7/25
8/1
8/8
8/15
8/22
8/29
9/5
9/12
9/19
9/26
10/3
10/10
WEEK START

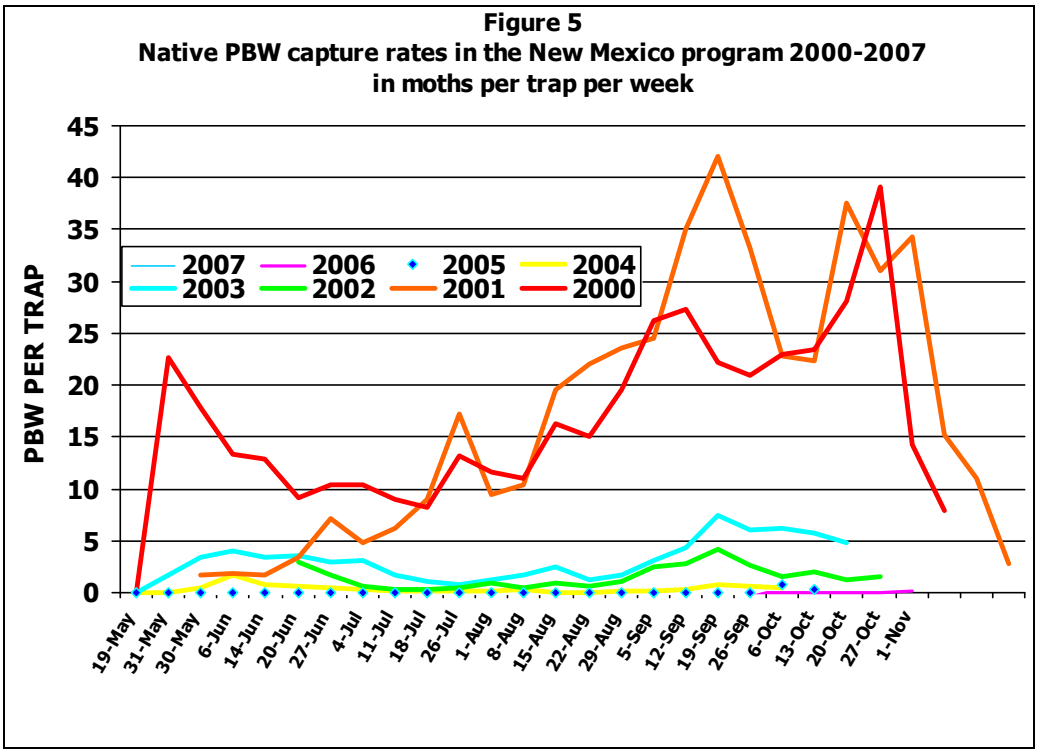
Figure 5
Native PBW capture rates in the New Mexico program 2000-2007
in moths per trap per week
PBW PER TRAP
45
40
35
30
25
20
15
10
5
0
2007
2006
2005
2004
2003
2002
2001
2000
19-May
31-May
30-May
6-Jun
14-Jun
20-Jun
27-Jun
4-Jul
11-Jul
18-Jul
26-Jul
1-Aug
8-Aug
15-Aug
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5-Sep
12-Sep
19-Sep
26-Sep
6-Oct
13-Oct
20-Oct
27-Oct
1-Nov

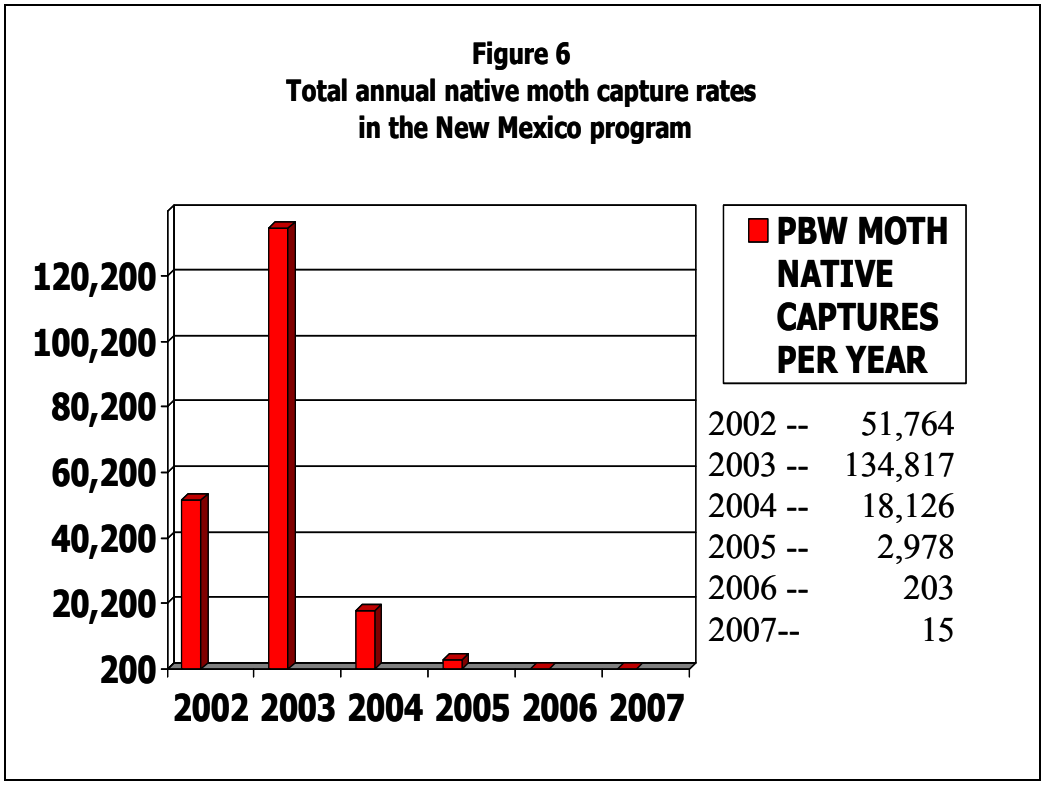
Figure 6
Total annual native moth capture rates
in the New Mexico program
120,200
100,200
80,200
60,200
40,200
20,200
200
2002 2003 2004 2005 2006 2007
PBW MOTH NATIVE CAPTURES PER YEAR
2002 -- 51,764
2003 -- 134,817
2004 -- 18,126
2005 -- 2,978
2006 -- 203
2007-- 15

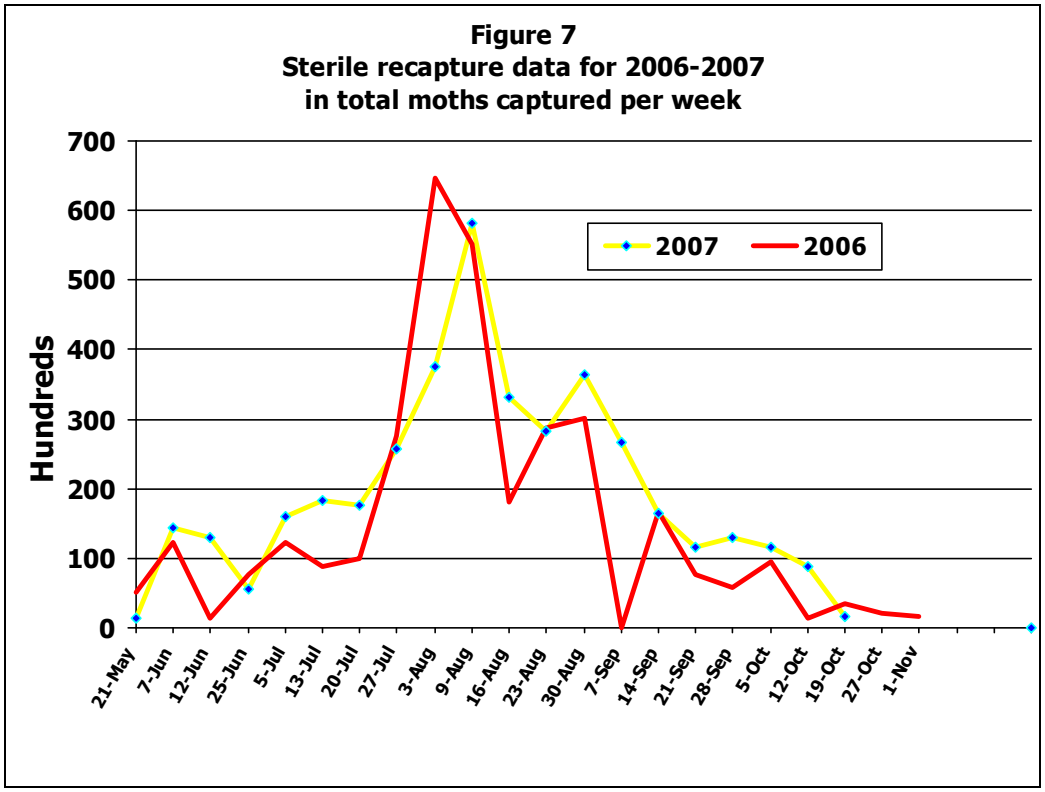
Figure 7
Sterile recapture data for 2006-2007
in total moths captured per week
Hundreds
700
600
500
400
300
200
100
0
2007
2006
21-May
7-Jun
12-Jun
25-Jun
5-Jul
13-Jul
20-Jul
27-Jul
3-Aug
9-Aug
16-Aug
23-Aug
30-Aug
7-Sep
14-Sep
21-Sep
28-Sep
5-Oct
12-Oct
19-Oct
27-Oct
1-Nov