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### Authors

Jordan, Kyle K.  
Riegel, Claudia  
Bauder, Friederike M.  
[et al.](#)

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# Urban Field Efficacy of a New Cholecalciferol-based Soft Bait on Commensal Rats in New Orleans, Louisiana, USA

Kyle K. Jordan

BASF Corp., Research Tringle Park, North Carolina

Claudia Riegel, Friederike M. Bauder, and Philip L. Smith

City of New Orleans Mosquito, Termite, and Rodent Control Board, New Orleans, Louisiana

**ABSTRACT:** Selontra® Rodent Bait (BASF, Ludwigshafen, Germany) is a cholecalciferol-based soft bait that exhibits high palatability both in the lab and field. Because of the attributes and mode of action of cholecalciferol, isolated field populations of rodents can often be controlled by Selontra within one week after initial bait exposure. Baiting trials were established at five sites in the city of New Orleans, Louisiana to investigate the field efficacy of Selontra against roof rats (three sites) and Norway rats (two sites). Comparison of pre- and post-baiting census data indicates an average control rate of 97.7% for roof rats and 88.5% for Norway rats.

**KEY WORDS:** commensal rats, rodent bait, Selontra®, vitamin D

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## INTRODUCTION

A variety of active ingredients are available for modern rodent control, but anticoagulants, cholecalciferol, and bromethalin have become predominant in the professional pest control market. While anticoagulants and bromethalin are often criticized for their risk of non-target poisoning, one of the primary reasons cholecalciferol baits have not been extremely effective in the market is because of palatability issues. Meehan (1984) observed that rates any higher than the current industry standard of 750 ppm showed repellency to rodents. This was supported by Dedovic et al. (2012), whose research indicated that cholecalciferol was the least consumed bait in their study, further commenting that the palatability needed to be improved to be successful, particularly in the presence of competing food sources.

Restrictions on anticoagulant use continue to increase and documented genetic resistance to anticoagulants exists in rats and mice (Pelz et al. 2005), which has caused the professional pest control market to emphasize other classes of active ingredients – including cholecalciferol – as components of rodent control programs. Cholecalciferol acts as an acute toxicant, causing calcification of soft tissue which leads to what is commonly referred to as the ‘stop-feeding effect’ (Bell Labs 2010). This means affected rodents quickly stop contaminating foodstuffs or causing other damage. It has been shown to result in quick control of entire populations in some situations, which means less bait and labor involved on behalf of the pest management professional. Another positive effect of cholecalciferol is that it also exhibits a lower relative risk for primary poisoning to birds (Eason et al. 2012) and secondary poisoning for both dogs and cats (Marshall 1984, Eason et al. 1996).

A palatable cholecalciferol-based bait was developed by BASF (Ludwigshafen, Germany) and was tested in the urban environment in New Orleans, LA. The purpose of this trial was to assess the efficacy of Selontra® rodent bait in urban rat infestations. This report describes a series of field trials that utilized Selontra cholecalciferol bait for the control of *Rattus rattus* or *R. norvegicus*.

## METHODS

This study consisted of five treatment sites (three for roof rats and two for Norway rats; Table 1) using a pre- and post-baiting census with two separate indices as a means of measuring control.

### Pre-trial Survey

The trial site was systematically surveyed for evidence of infestation, such as the presence of burrows, droppings, and footprints, damage or feeding. Rodents were visually identified as *R. rattus* or *R. norvegicus*. Each site was evaluated for census diet introduction points, tracking patches, and bait point placement.

### Pre-treatment Census

Petri dishes (150 mm) containing 50 g of whole wheat (source: Whole Foods) and 150 × 15 mm Petri dish tracking patches containing play sand were positioned following a pre-trial survey. This allowed the rodents to acclimatize to the trays. On each of the three days following placement, the residual wheat in each tray was inspected, weighed to the nearest 1.0 g on a portable electronic balance, and replenished to an amount sufficient to provide a surplus until the next day’s visit. The amount taken by the rodents was recorded and the total amount of census diet eaten was calculated.

Tracking marks on the sand patches were quantified and recorded and the containers were shaken to remove tracks. The following scale was used:

- 0 = no tracks
- 1 = from 1 to 5 footprints
- 2 = from 6 footprints to 25% of the patch tracked
- 3 = from 25% to 95% of the patch tracked
- 4 = more than 95% of the patch covered with tracks

At the end of each evaluation, the total tracking score for the site was calculated by summing the scores from all patches. The tracking patches were left in position to be utilized during the bait treatment and the post-treatment census.

**Table 1. General descriptions of the five Selontra® study sites in New Orleans, Louisiana.**

Species	Site Name	Description	Competing Food Source(s)
<b>Roof rat</b> ( <i>Rattus rattus</i> )	Auto Lot	Exterior area with an on-site trailer/office	Trash cans and litter from nearby homeless population
	Bio Lab	Structure with activity inside and outside.	Food from human activity in structure
	Bordeaux	Residence with activity outside	Citrus trees and various urban sources
<b>Norway rat</b> ( <i>Rattus norvegicus</i> )	Firehouse	Structure with exterior activity	Restaurant waste and various urban sources
	St John	Residence with exterior activity	Food from human activity

**Pre-treatment Lag Period**

The pre-treatment census was followed by a pre-treatment lag period. This phase is necessary to ensure the target species is not simply taking the bait due to pre-baiting conditioning with the census diet. The duration of this lag period is typically seven days. During this period no census diet or bait was available on site and no observations were made on the infestations.

**Treatment Period**

The treatment was carried out with BAS 410 06 I rodenticide bait using a conventional surplus baiting

technique (Dubock 1984). The bait boxes (Protecta LP, Bell Laboratories, Milwaukee, WI), each containing approximately 120 g (six bait units), were installed in specifically-selected protected locations approximately 5 to 10 m (16-33 feet) apart throughout the infested areas. A total of 10 bait points were installed at each site except the Firehouse, where eighteen were installed. The following day the baits were checked visually for takes, weighed to the nearest 1.0 g, and replenished if necessary to an amount sufficient to avoid subsequent complete bait takes. Similar observations and recordings were made throughout the baiting period, with no more than 72 hours

**Table 2. Pre-treatment census data for each of the five Selontra® study sites in New Orleans, Louisiana, including census diet take and summed tracking scores.**

Species	Site	Day	Pre-Census Diet Take Total per day (g)	Pre-Census Tracking Score (summed)	
<b>Roof rat</b> ( <i>Rattus rattus</i> )	Auto Lot	1	63	14	
		2	51	11	
		3	94	14	
		<b>Total</b>	<b>208</b>	<b>39</b>	
	Bio Lab	1	12	8	
		2	15	5	
		3	23	9	
		<b>Total</b>	<b>50</b>	<b>22</b>	
	Bordeaux	1	78	13	
		2	107	11	
		3	70	5	
		<b>Total</b>	<b>255</b>	<b>29</b>	
<b>Overall Mean</b>			<b>57</b>	<b>15</b>	
<b>Norway rat</b> ( <i>Rattus norvegicus</i> )	Firehouse	1	385	55	
		2	524	50	
		3	815	52	
		<b>Total</b>	<b>1725</b>	<b>157</b>	
	St. John	1	871	35	
		2	832	37	
		3	991	37	
		<b>Total</b>	<b>2694</b>	<b>109</b>	
	<b>Overall Mean</b>			<b>1024</b>	<b>44</b>

between visits. The baiting period lasted at least 7 days and up to 30 days (until at least two inspections indicated a lack of activity), at which time a final bait take was recorded and the bait boxes were removed from the site. At each visit during the treatment period, activity on tracking patches was recorded and each dish was cleared, as during the pre-treatment census. Observations of any affected non-target animals were made during each visit.

### Post-treatment Lag Period

The treatment period was followed by an approximately 7-day lag period to enable any remaining rats a reasonable time to die/recover from rodenticide they may have ingested.

### Post-treatment Census

The post-treatment census was conducted in the same way as the pre-treatment census with tracking scores and census diet takes. Data collection for this census was carried out daily for 3 to 4 days. Trays for tracking stayed in the same locations throughout all phases of the field trials.

## RESULTS

An overview of census diet and bait consumption and tracking activity is shown in Tables 2, 3, and 4, and estimates of the population reduction are shown in Table 5. Figures 1-5 illustrate bait take and tracking activity for each of the sites. Non-target wildlife did not appear to be impacted by the bait treatment. An opossum at the Bordeaux site was observed consuming bait from one station over approximately 1.5 weeks but did not appear to

be harmed. Details of the non-target wildlife observed and weather conditions are shown in Table 6.

### Efficacy

The overall pattern of bait consumption was typical of an efficiently conducted treatment using the surplus baiting technique with a cholecalciferol rodenticide bait. For every site but the Bordeaux site, bait take on the first night of the bait treatment period was the highest, with at least half of the total bait being consumed during the first night (ranged 56-98%). At the Bordeaux site, bait consumption was steady the first three nights, with the percent take being 22%, 36%, and 35% for the first, second, and third nights, respectively. The daily bait take at each site decreased dramatically after the initial take.

During the treatment period the tracking score decreased significantly. Comparing the pre- and post-baiting census tracking values, the average percent population reductions were 98% for roof rats and 89% for Norway rats. Comparison of the census diet values indicates 100% control of roof rat populations and 90% control of Norway rat populations. After thorough searching of the site on each visit during both the pre- and post-treatment census and treatment period, four dead rats were found (three at the firehouse and one at St. John) and no non-target bodies were found.

Pre-treatment census results indicate that the three *R. rattus* sites (Auto Lot, Bio Lab, and Bordeaux) had moderate, stable infestations and the other two *R. norvegicus* sites (Firehouse and St. John) had very active infestations. High bait take during the first night indicates that there was not bait shyness and that the bait is palatable.

**Table 3a. Bait take and summed tracking scores recorded during the Selontra® baiting period at each of the three *Rattus rattus* sites in New Orleans, Louisiana.**

Species	Site	Day	Bait Take Total per day (g)	Tracking Score (summed)
Roof rat ( <i>Rattus rattus</i> )	Auto Lot	1	525	18
		2	16	34
		3	3	6
		4	2	2
		5	0	1
		<b>Total</b>	<b>546</b>	<b>61</b>
	Bio Lab	<b>Mean</b>	<b>109</b>	<b>10</b>
		1	13	15
		2	2	5
		3	0	1
		4	0	2
		5	0	0
	Bordeaux	6	0	0
		<b>Total</b>	<b>15</b>	<b>23</b>
		<b>Mean</b>	<b>2.5</b>	<b>4</b>
		1	39	4
		2	63	4
		3	62	5
	Overall	4	0	1
		5	12	6
		6	0	1
7		0	0	
<b>Total</b>		<b>176</b>	<b>21</b>	
<b>Mean</b>		<b>25</b>	<b>3</b>	
<b>Overall Mean</b>			<b>41</b>	<b>6</b>

enough to encourage heavy feeding right away. The BAS 410 06 I rodenticide bait treatment resulted in a significant reduction of rat activity by day seven of the treatment period at each of the roof rat sites. At the Firehouse site, the reduction was still estimated to be at least 88%, even though feeding was detected during the baiting period. Bait take declined from 720 g on the first night to 7 g by the 7<sup>th</sup> day. An overall decline in feeding in conjunction with a decrease in tracking scores indicated a significant decrease in population. The St John site experienced a similar pattern where feeding decreased the first week with a slight increase over the baiting period, while tracking scores continued to decline. Using the two indices of measurement, an 89-100% population reduction can be estimated, which falls within the parameters of the guideline for an acute toxicant such as cholecalciferol. The results show that in an urban area, Selontra is an efficacious rodenticide bait against both *Rattus* species.

## DISCUSSION

Pre-treatment census results indicate that the three *R. rattus* sites (Auto Lot, Bio Lab, and Bordeaux) had moderate, stable infestations and the *R. norvegicus* sites (Firehouse and St John) had very active infestations. High bait take during the first night indicates that there was not bait shyness and that the bait is palatable enough to encourage heavy feeding right away. The Selontra<sup>®</sup> treatment resulted in a significant reduction in rat activity by day seven of the treatment period at each of the roof rat sites. At the Firehouse site, the reduction was still estimated to be at least 88%, even though feeding was detected during the baiting period. Bait take declined from 720 g on the first night to 7 g by the seventh day. An overall decline in feeding in conjunction with a decrease

in tracking scores indicated a significant decrease in population. The St John site experienced a similar pattern where feeding decreased the first week with a slight increase over the baiting period, while tracking scores continued to decline. Using the two indices of measurement, an 89-100% population reduction can be estimated, which falls within the guidelines for an acute toxicant such as cholecalciferol. The results show that in an urban area, Selontra<sup>®</sup> is an efficacious rodenticide against both *Rattus* species.

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**Table 3b. Bait take and summed tracking scores recorded during the Selontra<sup>®</sup> baiting period at the two *Rattus norvegicus* sites in New Orleans, Louisiana.**

Species	Site	Day	Bait Take Total per day (g)	Tracking Score (summed)
Norway rat ( <i>Rattus norvegicus</i> )	Firehouse	1	720	55
		2	131	20
		3	19	16
		4	7	22
		5	37	19
		6	23	7
		7	40	4
		8	65	1
		<b>Total</b>	<b>1042</b>	<b>144</b>
		<b>Mean</b>	<b>130</b>	<b>18</b>
	St John	1	789	32
		2	105	9
		3	102	11
		4	31	13
		5	179	19
		6	90	12
		7	61	4
		8	61	2
9		0	0	
10		0	0	
	<b>Total</b>	<b>1417</b>	<b>102</b>	
	<b>Mean</b>	<b>142</b>	<b>10.2</b>	
<b>Overall Mean</b>		<b>136</b>	<b>14.1</b>	

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**Table 4. Post-treatment census data for each of the five Selontra® study sites in New Orleans, Louisiana, including census diet take and summed tracking scores.**

Species	Site	Day	Post-Census Diet Take Total per day (g)	Post-Census Tracking Score, Total per day	
Roof rat ( <i>Rattus rattus</i> )	Auto Lot	1	0	2	
		2	0	1	
		3	0	0	
		<b>Total Mean</b>	<b>0</b>	<b>3</b>	
	Bio Lab	1	0	0	
		2	0	0	
		3	0	0	
		<b>Total Mean</b>	<b>0</b>	<b>0</b>	
	Bordeaux	1	0	0	
		2	0	0	
		3	0	0	
		<b>Total Mean</b>	<b>0</b>	<b>0</b>	
<b>Overall Mean</b>			<b>0</b>	<b>0</b>	
Norway rat ( <i>Rattus norvegicus</i> )	Firehouse	1	35	2	
		2	0	7	
		4	0	9	
		<b>Total Mean</b>	<b>35</b>	<b>18</b>	
	St John	1	173	4	
		2	200	2	
		3	205	7	
		<b>Total Mean</b>	<b>578</b>	<b>13</b>	
	<b>Overall Mean</b>			<b>103</b>	<b>5</b>

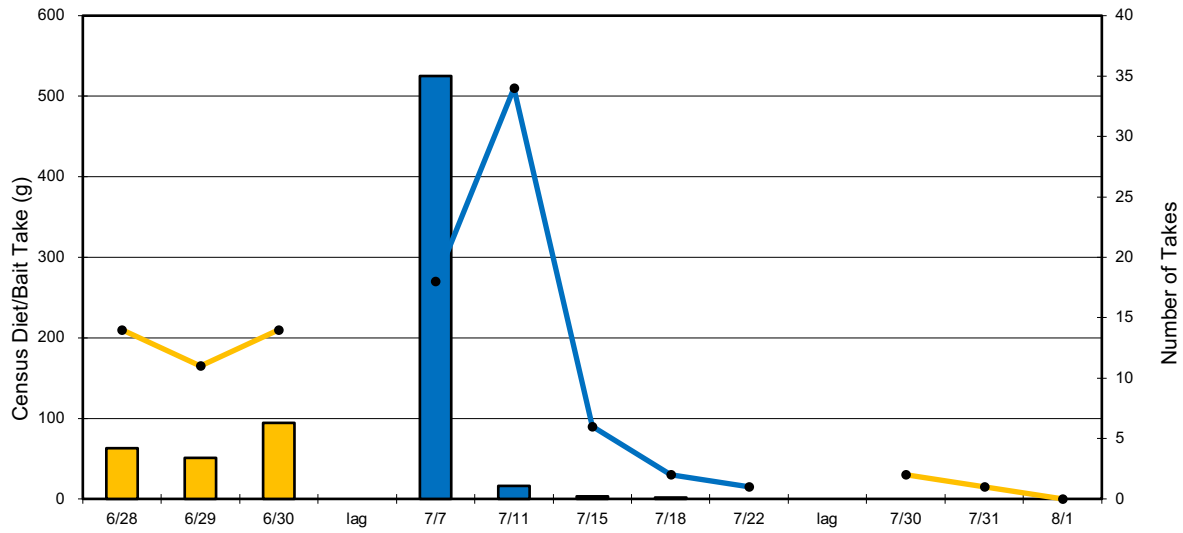
**Table 5. Percent reduction\* in rat population at each of the five study sites in New Orleans, Louisiana after baiting with Selontra®.**

Species	Site	Diet Take (g)			Tracking Score		
		Pre-treatment	Post-treatment	%	Pre-treatment	Post-treatment	%
Roof rat ( <i>Rattus rattus</i> )	Auto Lot	94	0	100	14	1	93
	Bio Lab	23	0	100	9	0	100
	Bordeaux	70	0	100	5	0	100
	Average	62	0	100	9	0	98
Norway Rat ( <i>Rattus norvegicus</i> )	Firehouse	815	12	98	52	6	88
	St John	991	193	81	37	4	89
	Average	903	103	90	45	5	89

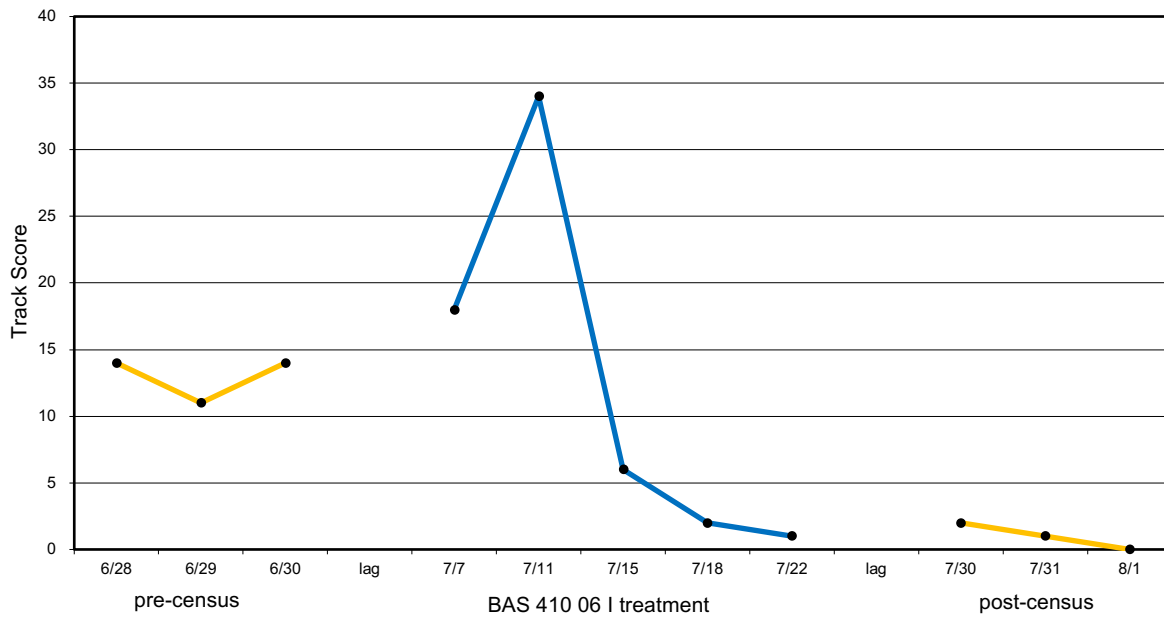
\*Percent reduction = (pre-treatment census - mean post-census)/(pre-treatment census) x 100

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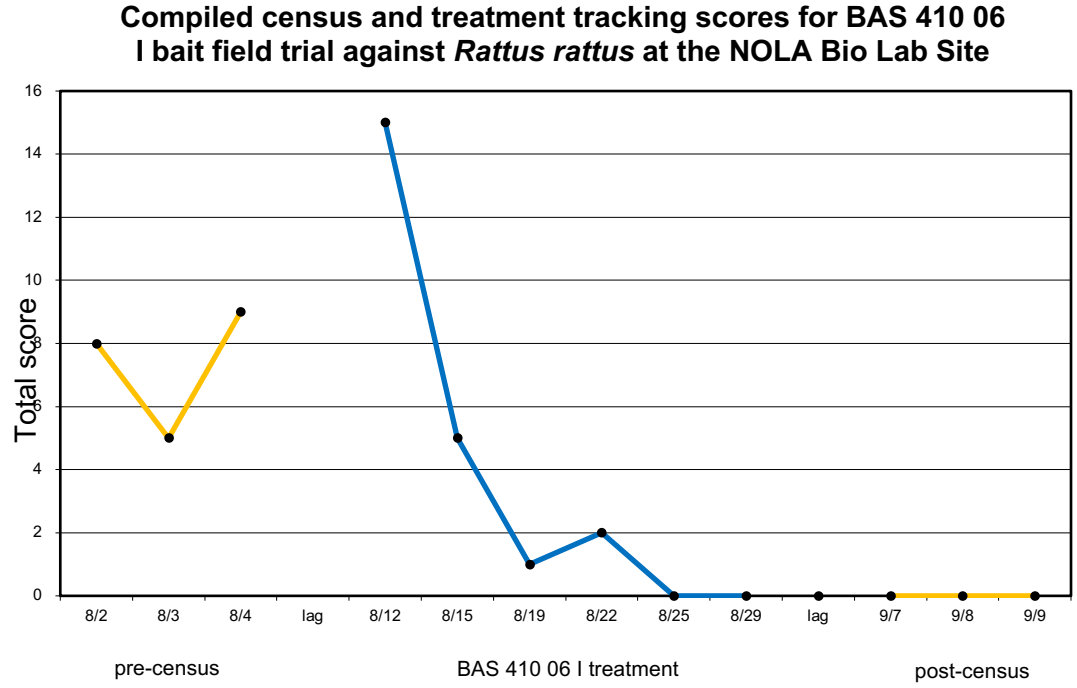
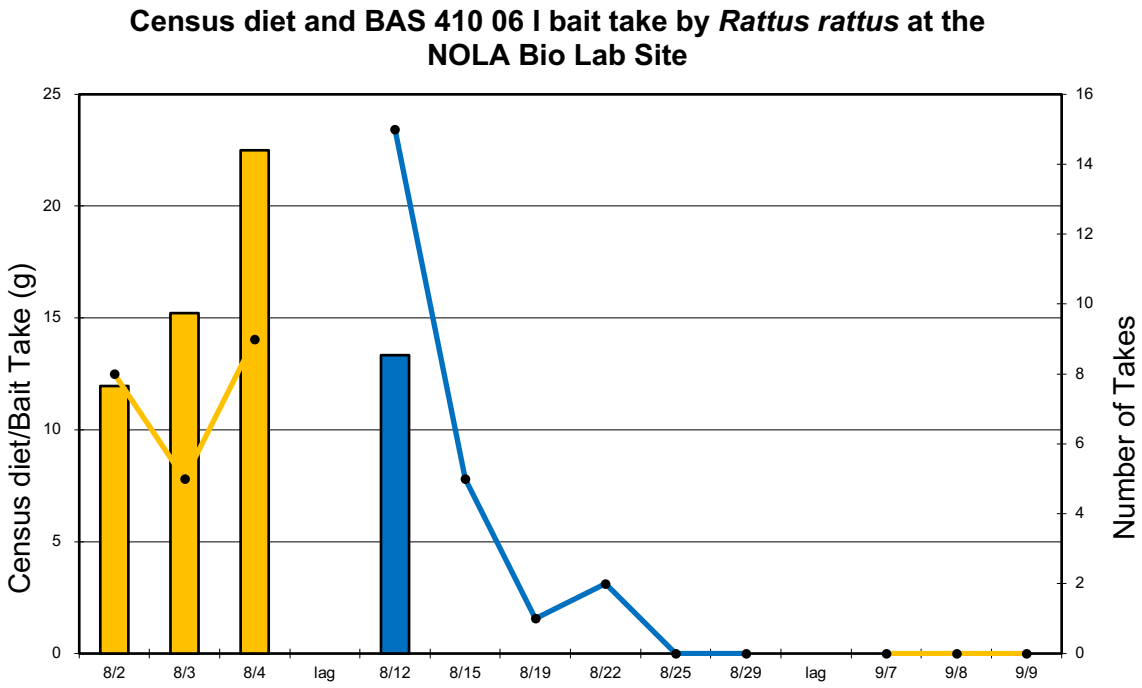
**Census diet and BAS 410 06 I bait take by *Rattus rattus* at the NOLA Auto Lot site**



**Compiled Census and Treatment Tracking Scores for BAS 410 06 I bait against *Rattus rattus* at the NOLA Auto Lot site**



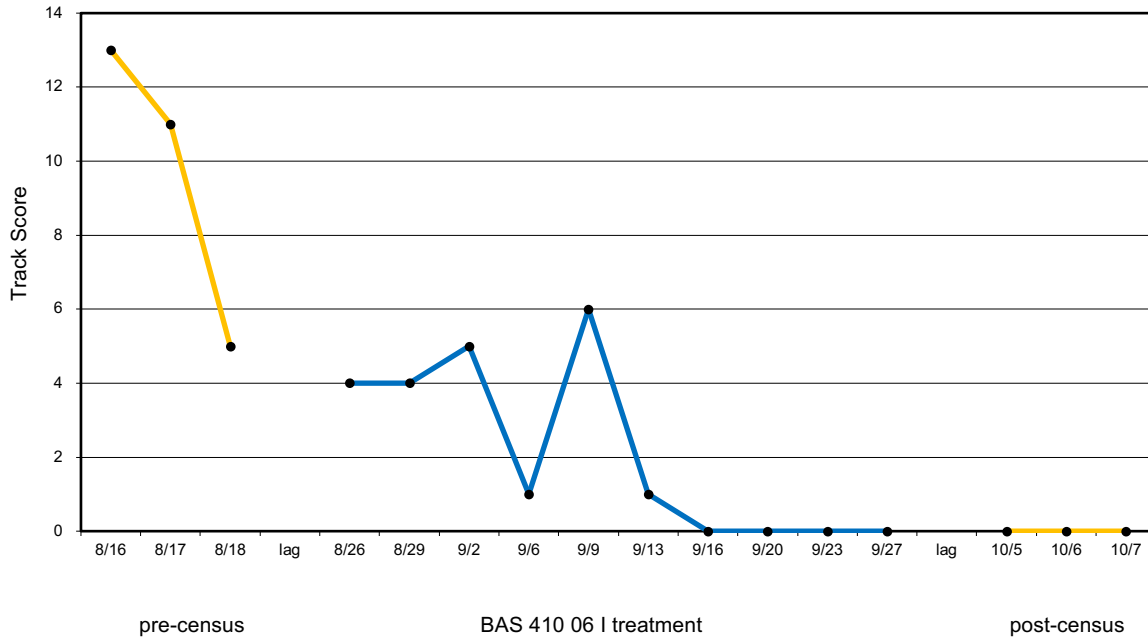
**Figure 1. Census diet consumption, Selontra<sup>®</sup> rodent bait take (lab code BAS 410 06 I), and tracking data for the pre-baiting census, baiting period, and post-baiting census for *Rattus rattus* at the Auto Lot site.**



**Figure 2. Census diet consumption, Selontra<sup>®</sup> rodent bait take (lab code BAS 410 06 I), and tracking data for the pre-baiting census, baiting period, and post-baiting census for *Rattus rattus* at the Bio Lab site.**



**Compiled census and treatment tracking scores for BAS 410 06 I bait field trial against *Rattus rattus* at the NOLA Bordeaux site**

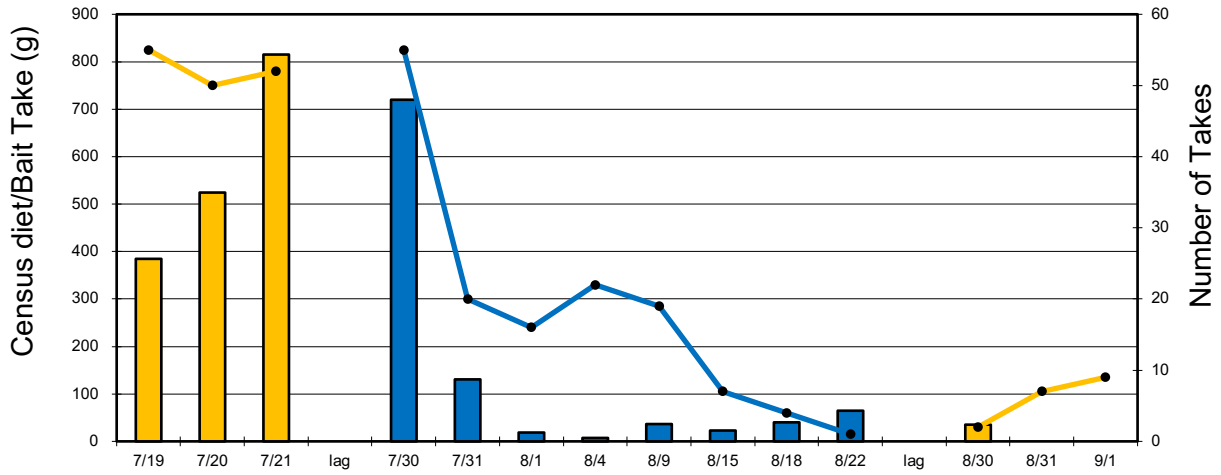


**Figure 3. Census diet consumption, Selontra® rodent bait take (lab code BAS 410 06 I), and tracking data for the pre-baiting census, baiting period, and post-baiting census for *Rattus rattus* at the Bordeaux site.**

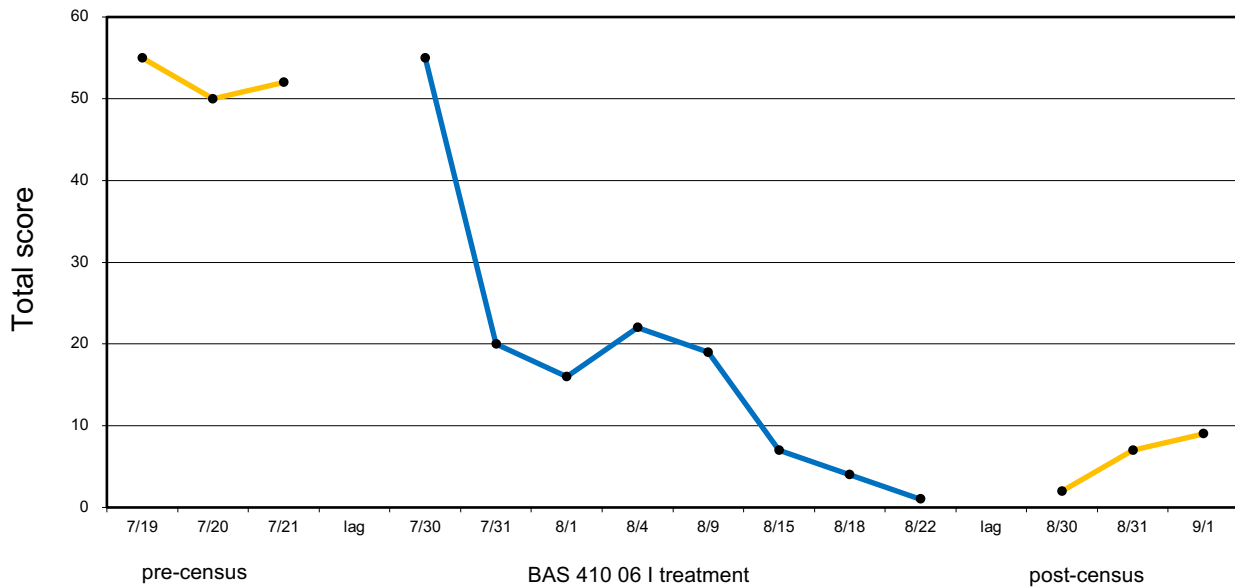
**Table 6. Non-target species observed at the five Selontra® study sites in New Orleans, Louisiana.**

Site	Species	Description
Auto Lot	None	n/a
Bio Lab	None	n/a
Bordeaux	Opossum	Passing through property
Firehouse	None	n/a
Willie's	Cat	Neighbor's cat

**Census diet and BAS 410 06 I bait take by *Rattus norvegicus* at the NOLA Firehouse site**

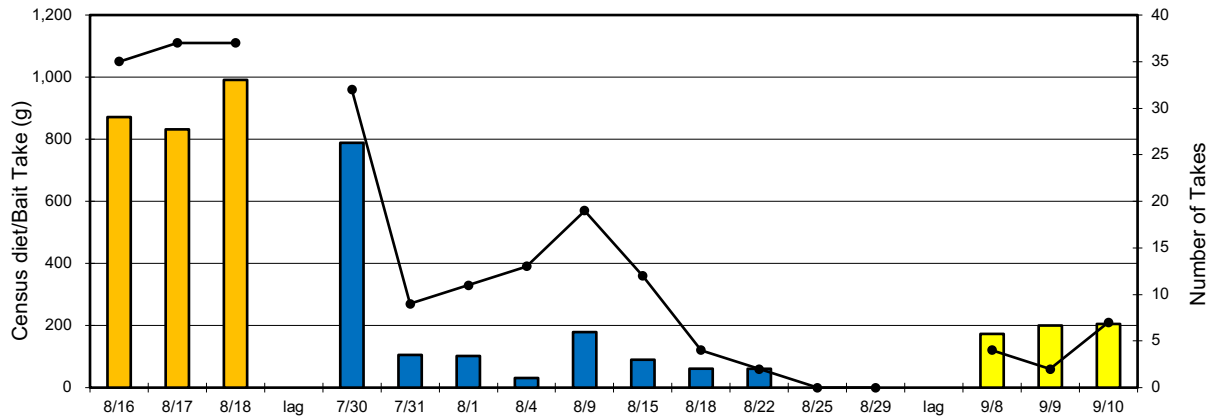


**Compiled census and treatment tracking scores for BAS 410 06 I bait field trial against *Rattus norvegicus* at the NOLA Firehouse site**

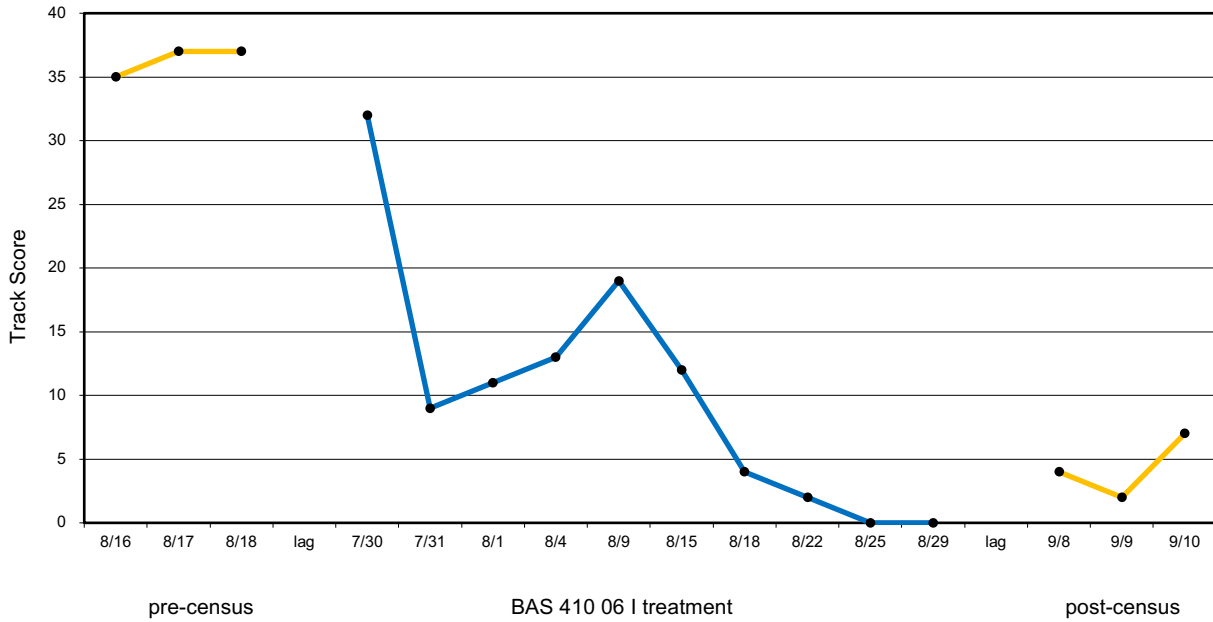


**Figure 4. Census diet consumption, Selontra® rodent bait take (lab code BAS 410 06 I), and tracking data for the pre-baiting census, baiting period, and post-baiting census for *Rattus norvegicus* at the Firehouse site.**

**Census diet and BAS 410 06 I bait takes by *Rattus norvegicus* at the NOLA St John site**



**Compiled census and treatment tracking scores for BAS 410 06 I bait field trial against *Rattus norvegicus* at the NOLA St John site**



**Figure 5. Census diet consumption, Selontra® bait take (lab code BAS 410 06 I), and tracking data for the pre-baiting census, baiting period, and post-baiting census for *Rattus norvegicus* at the St John site.**