Impact of Red Imported Fire Ant Predation on Low-nesting Colonial Waterbirds on the Rollover Pass Islands, Texas

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The National Audubon Society and the Texas General Land Office have had concerns over the invasion of the red imported fire ant, *Solenopsis invicta* Buren., into the waterbird rookeries along the Texas coast on natural and man-made "spoil" island, and, on 19 August 1988, requested that the Texas Agricultural Extension Service assist in an effort to control the ants on these sites.

The red imported fire ant has been documented to feed on hatching eggs (Johnson 1961, 1962, Mount 1981, Mount et al. 1981, Wilson and Silvy 1988). However, the impact of this ant behavior on egg clutch survival, nesting success and population density in fire ant-infested areas has remained largely undocumented. In the absence of this information, suppression programs using available control technology are not ecologically and economically justifiable. Current programs provide only temporary suppression and require repeated applications. Discontinuation of treatments can result in reinvasion of the ants to levels that may exceed those prior to initial treatment.

A three-year pilot program was conducted to document the impact of a fire ant suppression program, based on the use of environmentally acceptable management tactics, on fire ant foraging activity and waterbird production.

Materials and Methods

Heavily infested islands at Rollover Pass in East Galveston Bay were selected for this pilot program. These islands are colonized, from March thr9ough August, by more than a dozen ground- and shrub-nesting waterbirds including the great egret (Casmerodius albus; great blue heron, Ardea herodis; olivaceous cormorant, Phalacrorox olivaceus; snowy egret, Egretta thula; Louisiana (tri-Color) heron, Hydranassa tricolor; roseate spoonbill, Ajaia ajaja; laughing gull, Larus atricilla; gull-billed tern, Gelochelidon nilotica; and Forster's tern, Sterna forsteri.

Treatment regimes were based on a preliminary fire ant survey and the geography of the four Rollover Pass islands. Island 1 and the eastern half of Island 4 were treated on 27 February, 29 September 1989 and 28 September 1990 using the product, Logic® (fenoxycarb), an insect growth regulator, at a rate of 1.5 lbs. per acre to maintain low levels of fire ant activity. Island 3 and the west half of Island 4 were left untreated and had high levels of fire ant activity.

A preliminary survey of fire ant mound densities was made 27 February 1989 by counting the number of fire ant active mounds within a 0.25-acre circular plot in the center of Island 4.

Thereafter, relative foraging ant activity between treated and untreated areas was monitored using olive oil-soaked index cards. Ten one-inch-square cards were positioned in a transect line across each island or island portion. The number of ants associated with each card was estimated after 0.5 to 24 hours of exposure (23-24 May and 29 September 1989; 21 April, 1 June and 28 September 1990, and 21 May 1991).

During periodic visits in 1990, 6 or more randomly-selected, egg-containing waterbird nests were marked in treated and untreated areas. Numbers of marked nests containing chicks were determined during subsequent visits. Percent mortality was calculated from these sets of marked nests and observations were made to determine cause of death.

During 1991 sets of nests containing eggs and young birds were marked with surveyors stakes and monitored regularly from May through July. Ten nests on the treated and untreated halves of Island 4 were marked 2 May and monitored on 12 May. On 21 May, an additional 10 nests on each half of Island 4 were marked and monitored 5, 13 and 19 June and 2, 9 and 19 July. On each visit, the presence of eggs, young birds with down, pinfeather and/or feathers was documented for each nest. From data obtained, the number of monitored nests occupied, percent of nests with successful brood, cumulative number of eggs and cumulative number of feathered offspring reared could be computed for each half of the island. Results of statistical analyses are not presented in this report.

Results and Discussion

A preliminary survey documented an estimated 180 active fire ant mounds per acre on Islands 1, 3 and 4. Island 2 was found to harbor primarily a native ant species, Monomorium minutum (Buckley), the little black ant. This island was left untreated. The effects of the 27 February 1989 Logic® treatments were not evident during the 1989 breeding season (**Table1**) due to either the use of improperly stored, rancid product or because of low foraging activity at the time of treatment.

September treatments, applied when the islands were unoccupied by migratory waterbird species, proved to be successful in reducing fire ant foraging and nesting activity by the following spring when birds began to arrive and nest. From 21 April 1990 through the remainder of the pilot program, ant activity on the Logic® treated half of Island 4 was reduced by 79-99 percent.

Survey of nesting waterbirds on 23-24 May 1989 provided little documentation of the impact of ant foraging on hatchling survival, although some chicks were observed being overwhelmed by red imported fire ants while hatching. In June 1989, hurricane Alison flooded the Rollover Pass Islands with a 5 ft. tide and 27 inches of rain. Adverse weather conditions eliminated bird nesting activities and all developing waterbirds. Hurricane Chantal produced 6 inches of rain on the islands on 1 August. Thus, no young developed on these islands in 1989.

On 21 April 1990, waterbird nesting was already in progress, preventing a spring broadcast Logic® application. The 29 September 1989 Logic® application to the eastern half of Island 4 had

resulted in a significant 90 percent reduction in foraging activity on olive oil-soaked index cards.

Heavy rains and floods occurred in May 1990 and on 1 June, high tides caused flooding conditions, and many laughing gull and tri-color heron nests were submerged.

Although flood-related mortality of hatchling waterbirds was documented in April and May 1990, ant-related mortality on the fire ant-infested portion of Island 4 was not documented until after June 1. Mortality increased to 100 percent of marked nests through the remainder of the monitoring period (**Table 2**). Unfortunately, the monitoring of nesting success in the Logic® treated half of the Island 4 was discontinued after 1 June 1990.

During 1991, the breeding season began 15 to 30 days earlier than usual. On 28 April 1991, half of the tri-color heron population developing on the islands was lost due to high tides. Little ant-related mortality of hatchlings was observed prior to the end of May and only slight differences in the number of occupied nests were noted until mid-June. Thereafter, occupancy of marked nests on the untreated, fire ant-infested part of Island 4 decreased from 13 to 56 percent (Table 3). Nest on the treated part of the island were used up to three times during the monitoring period, often by different bird species. Successful brooding in marked nest sets, already about 70 percent reduced in the ant-infest area during May, declined to 0 by 19 June. No successful brooding occurred thereafter in the presence of fire ant predation.

Egg production in treated and ant-infested portions of Island 4 was never dramatically different (**Table 3**). However, the number of eggs present in the marked nest set on the untreated area was 6 to 11 percent greater than in nests within the treated area from 19 June through the remainder of the study. This difference resulted from 1) nests being occupied by young birds in the treated area and 2) from re-nesting attempts by adult birds in the untreated area.

The most dramatic statistics generated during this study were the cumulative number of offspring produced in nest sets on the ant-infested versus Logic®-treated parts of Island 4: 6 versus 72, a 92 percent reduction of waterbird production during this monitoring period. Even though these migratory colonial waterbird species appear to breed successfully from the end of February through the end of April in the presence of high red imported fire ant densities, late season success is dramatically reduced - even eliminated. Since weather-related nesting failures often occur during the early spring months, fire ants can become an important limiting factor in the reproduction of waterbird species attempting to nest from May through July.

Conclusions

1. Red imported fire ants can be sufficiently suppressed on rookery islands of the Texas coast using an annual fall broadcast application of Logic® insect growth regulator to reduce

midsummer predation by ants on nesting waterbirds.

2. Little fire ant-related mortality of hatchling waterbirds was observed or documented from late February through mid May, but mortality of young birds increased to 100 percent in monitored nest sets during June and through the remainder of the nesting season (the end of July).

3. Weather conditions play a major role in the ability of both birds and fire ants to successfully nest on these islands.

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Table 1. Number of red imported fire ant workers associated with olive oil-soaked index cards, Rollover Pass Islands, Texas.

Average no. foraging red imported fire ants per olive oil-treated card

Date	**Untreated Island 4 East**	**Treated Island 4 West**	**Percent diff.**
23-24 May 1989	31.8	27.6	0
29 September 1989	14.0	18.0	23
21 April 1990	2.7*	27.9*	90
1 June 1990	0.2	180.0	99
10 July 1990	4.0	19.5	79
28 September 1990	3.6	46.0	92
21 May 1991	2.5	85.5	97

* Indicates first date for significant differences of means using the Student's t test (P0.05; d.f. = 18)

Table 2. Percent mortality of hatchling waterbirds on treated and untreated (fire ant infested) parts of Rollover Pass Island 4, Galveston Bay, Texas, 1990.

Percent mortality of hatchling waterbirds (number of marked nest observation in parentheses)

Date	**Treated**	**Untreated**
April 21* - May 6	14.3 (7)	50.0 (6)
May 6 - June 1	0.0 (4)	50.0 (4)
June 1* - June 15	10.0 (10)	--
June 15* - June 24	N/O	100.0 (?)
June 24* - July 3	N/O	100.0 (5)
July 3* - July 10	N/O	100.0 (3)
July 10 - July 20	N/O	100.0 (3)

*Dates when sets of nests containing waterbird eggs were marked for subsequent observation of hatchling success.
N/O = None observed

Table 3. Waterbird* rookery success in fire ant infested and treated halves of Island 4, Rollover Pass Islands, Texas, 1991.

	May 2	**May 12**	**May 21**	**June 5**	**June 13**	**July 1**	**July 2**	**July 9**	**July 19**
No. of nests monitored:	10	10	20	20	20	20	20	20	20
No. of nests occupied:									
Ants present	10	9	18	18	10	10	13	7	4
Ants removed	10	10	20	15	16	14	15	15	9
Percent diff.	0	-10	-10	+16	-38	-29	-13	-53	-56
Percent successful brood nests:									
Ants present	30	33	22	22	11	0	0	0	0
Ants removed	100	100	80	80	94	93	100	100	100
Percent diff.	-70	-67	-73	-73	-88	-100	-100	-100	-100
Cumulative # of eggs:									
Ants present	28	28	59	68	76	87	102	103	103
Ants removed	35	35	59	76	78	78	78	94	97
Percent diff.	-20	-20	0	-11	-3	+11	+15	+9	+6
Cumulative # feathered offspring:									
Ants present	0	0	0	5	6	6	6	6	6
Ants removed	0	0	28	28	37	39	43	61	72
Percent diff.	0	0	-100	-82	-84	-85	-86	-90	-92

* Colonial waterbird nest monitored: Great egrets, great blue heron, snowy egret, roseate spoonbill, tri-color heron, cormorant, gull.