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## FURTHER STUDIES OF THE BLACK RAT ON SAN SALVADOR ISLAND, BAHAMAS

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### ABSTRACT

This paper presents the results of our continuing studies of the black rat (*Rattus rattus*) on San Salvador Island, Bahamas from 1995 to 2001. The black rat can live in a wild state as well as a commensal setting with humans. We have studied the rat in the wild in the interior of the island as well as in a commensal setting in and around the Bahamian Field Station. We are reporting here comparisons of habitat selection, density of populations, food habits and behavior of the species in these two settings. During the last few years the black rat has expanded its populations from a wild habitat in the interior of the Island to a commensal habitat in the human inhabited area along the coast.

### INTRODUCTION

The only land mammals known to have occurred on San Salvador Island are five species of bats (Anderson, 1994) and Old World rats and mice brought aboard ships as early as the 16<sup>th</sup> century. We have found no published studies in the literature of these rodents on the island. In March, 1995, we set live traps along the Hard Bargain Trail, 1.6km from its beginning at the east side of the Island. That trapping resulted in the capture of two rats that were (Hall *et al.* 1996).

The black rat is an important human commensal species found throughout the Old World. It has been known as the ship rat, and was brought to the New World in the 16<sup>th</sup> and 17<sup>th</sup> centuries aboard ships from Europe. Today the black rat is found in tropical America and islands of the West Indies (Schwarz and Schwarz 1967).

When we found the black rat in the interior of San Salvador Island in 1995, the species was not known to inhabit the coastal areas in association with the human population. However by January, 1996, rats were being reported near human habitations in coastal areas, living in a commensal association with humans. Rats were caught in and around the Bahamian Field Station and at Holiday Tract (Hall *et al.* 1998). The rat population seemed to be increasing dramatically, as local residents reported rats invading houses and agricultural fields. The rats had become a pest.

In this paper we present the results of our continuing study of the black rat on San Salvador through 2001. These results compare the rat populations in the two settings of wild and commensal in regard to habitat selection, density of populations, food habits, reproduction, behavior, and body mass.

### METHODS

The site along the Hard Bargain Trail is located more than 2 km from any human population. We consider this population to be living in a wild setting, not in contact with human populations. We have studied this population with live trapping and marking-recapture procedures. Each specimen when caught was identified to sex, weighed, measured, noted for reproductive activity, ear-tagged and released. This study has been conducted for a four-year period.

The area in and around the Bahamian Field Station was the main site for the study of the rat in a commensal setting. Rats were live trapped throughout the site. Rats were also caught at Bernie's Cave and Holiday Tract,

which were also considered to be commensal habitats (Figure 1). Twenty-five of the individuals from the commensal sites were prepared as museum skin and skull specimens. Other individuals were ear-tagged and released.

### RESULTS

The number of rats caught at the commensal sites exceeded the number caught at the wild site (Table 1). Most of the commensal specimens were trapped at the Bahamian Field Station.

**Table 1.** Results of live trapping.

Site	# Trapped
Commensal	
Bahamian Field Station	32
Bernie's Cave	2
Holiday Tract	4
Total	38
Wild	
Hard Bargain Trail	28
Total All Sites	66

Relative density of populations is expressed as the trap ratio, or number of rats caught per trap night (Table 2). The results indicate a somewhat higher trap ratio for the commensal population than for the wild population. This difference may not be significant. More trapping needs to be done to get a larger sample size.

**Table 2.** Relative Density, rats caught per trap night (trap ratio).

Site	Trap Nights	Rats Caught	Ratio
Commensal	185	38	0.21
Wild	173	28	0.16
Total	358	66	0.18

**Table 3.** Numbers and proportions of males and females.

Site	Male	Female	Total
Commensal	23 (0.62)	14 (0.38)	37
Wild	10 (0.40)	15 (0.60)	25
Total	33 (0.53)	29 (0.47)	62

Numbers and proportions of males and females for the commensal population and the wild population are listed in Table 3. There was a greater proportion of males at the commensal sites (0.62) and a smaller proportion of males (0.40) at the wild site.

Body measurements for 31 specimens are given in Table 4. There were no large differences between males and females for total body and tail lengths. One characteristic of the black rat is that the tail length is longer than the body length. The body/tail ratios we measured were consistent with this (Table 4).

**Table 4.** Mean tail and body measurements (mm) and body length/tail length ratio.

No.	Total Length	Tail	Body	Body/Tail
Males				
17	369.1	193.8	175.3	0.905
Females				
14	369.1	199.8	169.3	0.847
Total				
31	369.1	196.5	172.3	0.877

Mean body mass for males and females, and for wild and commensal rats (a total of 51 specimens) are listed in Table 5. Males seemed to be somewhat larger than females. There was no difference between commensal and wild rats.

We conducted our studies only during the months of January, March, May and June. Twenty female rats were examined for

reproductive activity. None of these females was pregnant or showed signs of having recent

**Table 5.** Mean body mass (grams).

Group	# inds.	Mean mass
Male	31	118 g
Female	26	106 g
Commensal	34	110 g
Wild	17	109 g

young. The adult males all had swollen testes, indicating reproductive activity. There seems to be a definite reproductive period that must be between summer and fall months.

#### DISCUSSION AND CONCLUSIONS

*Rattus rattus* is divided into 30 subspecies by Schwarz and Schwarz (1967). They assign the black rats in the West Indies to the subspecies *R. r. frugivorus*. The external body measurements for the rats on San Salvador were a little smaller than the measurements for West Indies black rats as listed by Schwarz and Schwarz (1967). Further morphometric and DNA studies need to be done in order to determine whether evolutionary changes have occurred in the black rat population on San Salvador, particularly since it may have been introduced as early as the 16<sup>th</sup> century.

There seem to be two basic requirements for the habitat of the black rat: 1) hiding places to escape to and 2) soft earth to burrow in. At the wild site along the Hard Bargain Trail there are many small caves and solution holes in the karst topography where the rats can hide. There is also soft earth that has accumulated in the sinkholes. Rat burrows are found in most of the sinkholes, and trapping was successful in the sinkholes and karst habitat. Food would be available in the form of fruit, nuts, berries and other vegetation.

In the commensal sites along the coastal human habitation, hiding places are provided by

trash piles and abandoned vehicles. Around the Bahamian Field Station there are many abandoned vehicles, some left over from the days of the active military base. Many of the rats caught at BFS were caught around these abandoned vehicles. Food would be available in the form of garbage in open trash barrels and dump sites, which are uncovered.

The black rat could have been introduced to the island of San Salvador as early as the beginning of the 16<sup>th</sup> century, and introductions could then have continued until the 19<sup>th</sup> century, when ships became less suitable for rats. Since this species can live in the wild, it would have been able to survive on the island in the absence of humans. With the build-up of human population beginning in the 18<sup>th</sup> century, human contact most likely was made. When students and faculty started coming to the island in the early 1990's, there was no indication of the presence of the black rat in the coastal areas inhabited by humans. We discovered the species to be in the interior of the island in 1995 after the Hard Bargain Trail had been cut into the interior. Then in 1996 the species began to be seen in the coastal areas and became a human commensal. The rats were invading houses and consuming agricultural crops. At the present time the black rat is very abundant throughout the coastal region and has become a serious pest.

The reasons for the expansion of the black rat population from a wild existence in the interior parts of the island to the human-inhabited coastal areas may be related to recent human activities. In recent years there has been an increase in human activity in the more remote areas of the island. The cutting of Hard Bargain Trail and other trails has promoted contact of rats with humans. Another factor is the increase of the human population on the island, which has doubled in recent years associated with the arrival of Club Med. Finally, the most negative factor is the manner of the disposal of trash and garbage in open pit dumps throughout the island. This provides an abundant food source from the garbage as well as hiding habitat in trash piles and abandoned vehicles.

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