

Nesting Preference and
Success of Purple Martins

Table of Contents:

Abstract.....	Pg. 3
Introduction.....	Pg. 4-6
Purpose/Hypotheses.....	Pg. 7
Materials.....	Pg. 8
Methods.....	Pg. 9
Tables.....	Pg. 10
Graph.....	Pg. 11-13
Results.....	Pg. 14-15
Conclusion.....	Pg. 16
Bibliography.....	Pg. 17
Acknowledgements.....	Pg. 18

Abstract:

The purpose of this experiment was to compare between Purple Martin nesting preference for three house types: the Natureline gourd, Supergourd, and Bo gourd. The first hypothesis was that cooler and wetter conditions during the nesting cycle will negatively impact purple martin nesting success. The second hypothesis was that Natureline gourds would be most preferred by the martins. Data was collected on the number of eggs, number of nestlings in each brood, and hatch date. Weekly nest checks for eggs and nestlings were performed. At an age of 11-21 days, nestlings were banded and weighed.

No significant differences in martin preference or nesting performance were detected between the three gourd types offered. In 2002, egg hatch date was significantly later than in 2003 and 2004. In 2004, brood size, number fledged, and weight were all significantly smaller than in 2002 and 2003. Average temperature was found to be significantly and progressively cooler from 2002 to 2004, average precipitation was highest in 2004 and lowest in 2003, and average wind speed was highest in 2002 and lowest in 2003.

Introduction

The Purple Martin (*Progne subis*) is the largest North American swallow, measuring 7-½ in. long and weighing 1.9 ounces. They are placed in the family Hiruninidae.

Adult Purple Martin males have glossy purple-black plumage. An adolescent male (less than 3 years of age) is only partially purple and is often mistaken for a female martin. The young females appear to be mainly brown with a slight purple color to their plumage. Adult females have more purple in their plumage than sub-adult females, but are not as dark or as fully colored as an adult male.

Purple Martins spend their breeding season in North America and their non-breeding season in parts of South America. Purple Martins in the eastern part of North America have become almost totally dependent on human-provided housing. In the western and southwestern areas of North America they still nest mostly in natural cavities.

Purple Martins form a monogamous and cooperative pair bond at the beginning of each breeding season. The male and female both participate in constructing the nest from mud, twigs, and grass. The female lays eggs at a rate of about one per day and will lay between 2 and 7 eggs. After the eggs hatch, both parents participate in feeding the nestlings continuously for 26-32 days until the nestlings are of age to fledge. The young are still dependent on their parents for food and training for 1 to 2 weeks after they fledge. Most fledglings return to roost in the same housing during this time period.

Purple Martins are aerial insectivores. As such they are sensitive to extreme weather conditions. If bad weather is persistent, it can cause a decline in insect population. If this happens Purple Martins will begin to starve. If the temperature is over 105° F. for series of days, nestling martins can perish from overheating.

Hanging Purple Martin housing (gourds) was originally a practice performed by Native Americans. The Purple Martins were appreciated because they kept crows away from Native American crops. Over time, this custom was copied by Europeans and passed down. In modern times, Purple Martin gourds are manufactured from plastic for people to hang around their houses and property.

In recent decades much time and effort has gone into perfecting the design of purple martin housing. An early offering was the Carrol gourd, a simple 8” diameter gourd with a round opening. In more recent years this design has been largely supplanted by larger gourd designs such as the Bo, Natureline and Supergourd. All of these later designs incorporate a nest inspection port and the option of crescent-shaped starling-resistant entry holes.

At John Jay High School a purple martin colony has been maintained each year since 1997. Currently three types of manufactured gourds are being used, the Natureline gourd, the Supergourd, and the Bo gourd. This colony has been maintained following guidelines set forth by the Purple Martin Conservation Association. These guidelines played a vital role in producing a successful Purple Martin colony. The Purple Martin Conservation Association suggests, among other things, that the following are performed:

weekly nest checks, nesting material changes, daily “walk-unders”, and keeping written records of everything that happens in the martin colony.

All four plastic gourd designs previously mentioned have been used at the John Jay martin colony. In 2003 a study was performed comparing the performance of Natureline and Carroll gourds. Martins were found to prefer the larger Natureline design, but similar numbers of young were fledged from both gourd types.

Purpose:

The purpose of this project was to compare the nesting success of the martin colony between successive years in terms of gourd occupancy, nestling weights and the number of young fledged per nest. Within the 2004 nesting season, similar comparisons were made between three different gourd types; the Bo, Natureline and Supergourd designs.

H₁

Cooler and wetter conditions during the nesting cycle will negatively impact purple martin nesting success.

H₂

Natureline gourds would be most preferred by the martins.

Materials:

Existing Purple Martin Colony w/ Nesting Activity

10 Plastico Natureline Purple Martin Gourds

10 Supergourds

10 Bo Gourds

4 Telescoping Metal Poles setup for Purple Martin Gourds

25' Measuring Tape

Purple Martin Bird Bands

Bird Banding Tool

Electronic Scale (measuring in grams)

Procedures:

At the school campus an active Purple Martin colony has been maintained for eight years. During the 2004 breeding season, the different gourd types were checked weekly for eggs and nestlings as a part of regular colony maintenance. Data was also collected on the weight of nestlings in an age range of 11-20 days old. Weight data was collected using a scale provided by a licensed fish and game bander. Data was found on the colony's 2002 breeding season and as a relative reference was included in the multiple year comparisons where applicable. All data collected was recorded and subjected to statistical analysis.

The Purple Martins were offered three gourd types during the 2004-breeding season: 10 Natureline gourds, 10 Supergourds and 10 Bo gourds; which were placed on the existing colony poles.

When the nestlings were approximately 11 to 21 days of age they were banded by a licensed fish and game bander. While the birds were being banded, they were weighed.

Data was collected on temperature, precipitation, and wind speed for April 15th - May 15th in 2002, 2003, and 2004. This data was analyzed and compared to try and find a reason for the difference found between the three years of data.

Table:

Purple Martin Use of Gourd Types

	Natureline	Supergourd	Bo	p-Value
Occupancy Rate	100%	100%	100%	--
Egg Hatch Date	117	120	123	0.265
Brood Size	3.7	4.2	3.8	0.528
Number Fledged	3.1	3.2	3.3	0.963

Multiple Year and Weather Analysis

	2002	2003	2004
Occupancy Rate	95%	80%	100%
Avg. Hatch Date	127	122	122
Brood Size	4.35	4.9	3.72
Number Fledged	--	4.75	3.2
% Mortality	--	4%	14%
Age at Banding	--	14.8	15.2
Weight	--	47	52.625

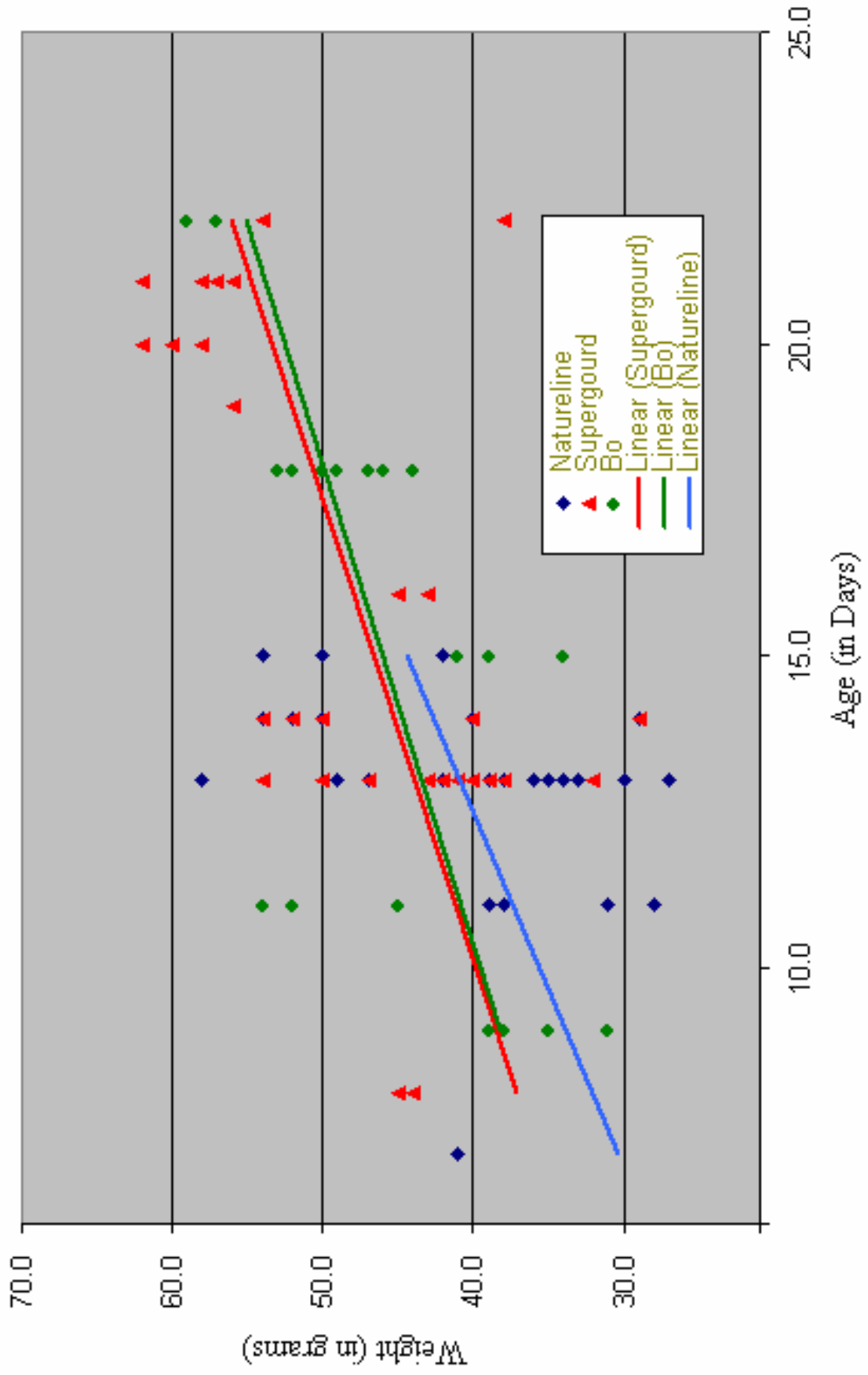
t-Test p-Values		
	2002-2003	2003-2004
Egg Hatch Date	0.037	0.868
Brood Size	0.447	0.026
Number Fledged	--	5.984E-05
Weight	--	3.415E-05

Weather Analysis

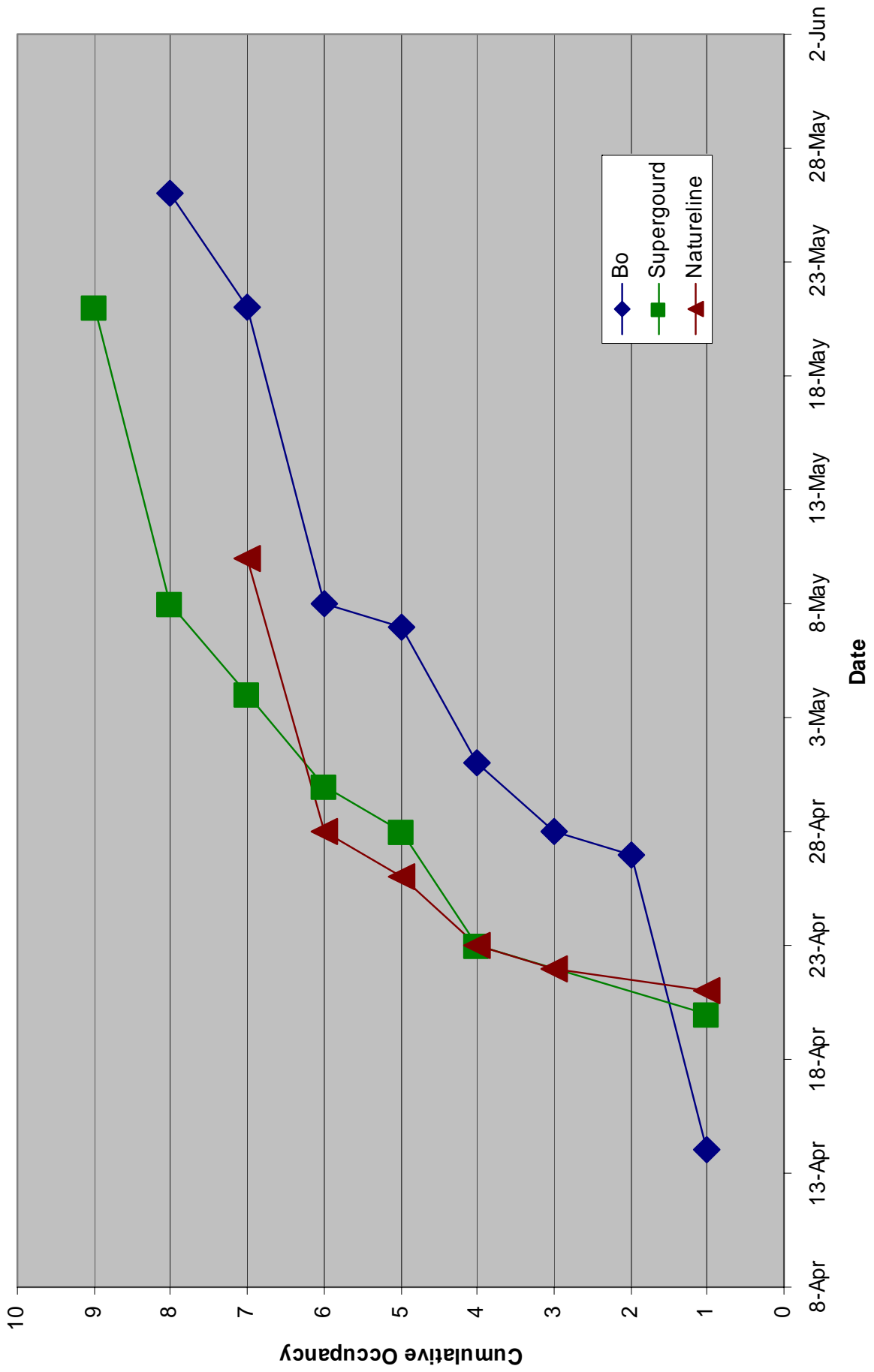
2002	
Avg Temp	83.45
Avg Precip	0.06
Avg Wind	10.94
2003	
Avg Temp	78.39
Avg Precip	0.00
Avg Wind	0.42
2004	
Avg Temp	72.61
Avg Precip	0.09
Avg Wind	7.68

2002-2003	
Temp	1.39E-05
Precip	4.63E-05
Wind	0.29
2003-2004	
Temp	2.62E-06
Precip	0.29
Wind	0.13

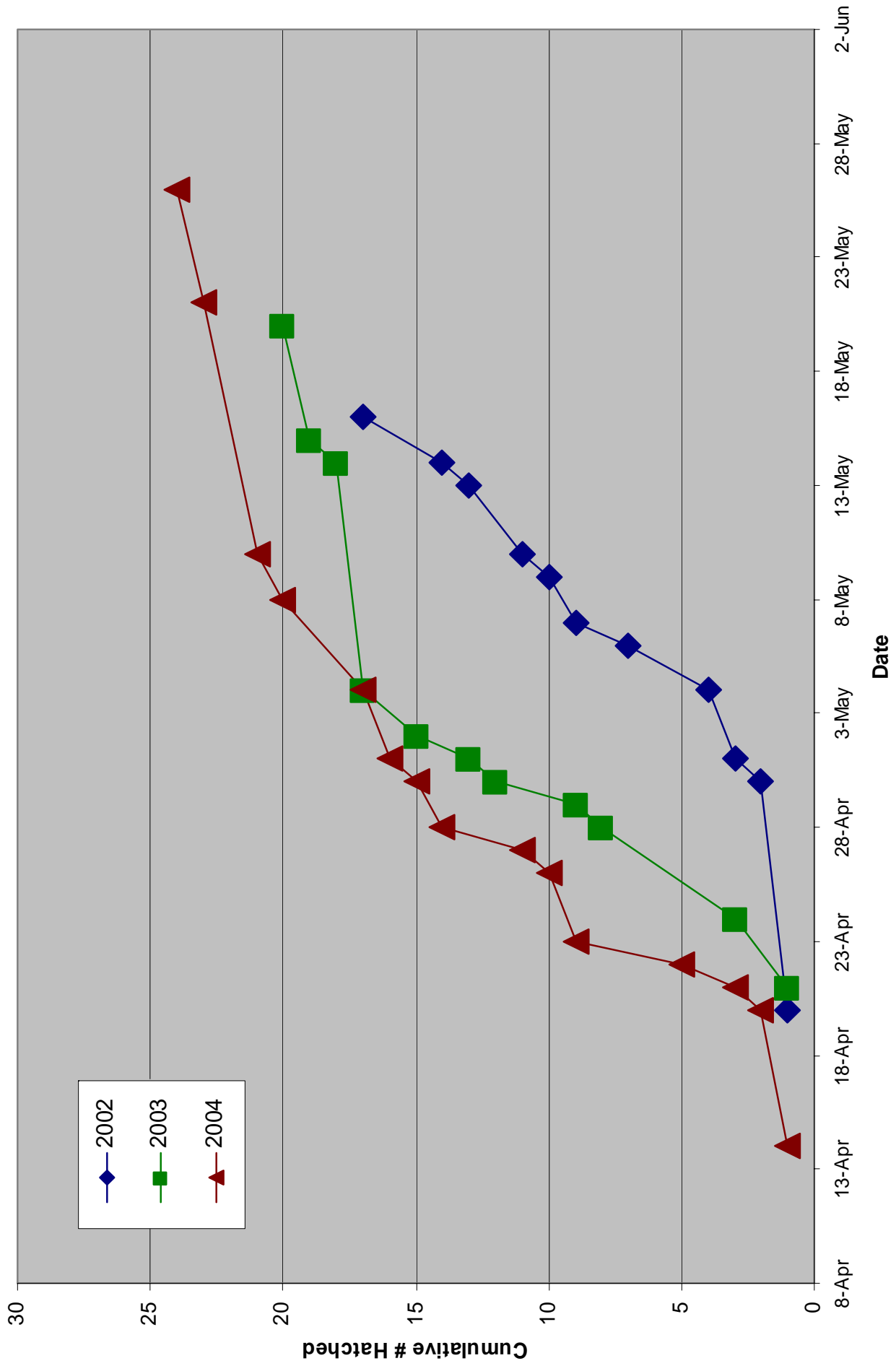
Scatter Plot; Weight vs. Age



2004 Occupation Rates determined by Hatch Dates (First Attempts only)



Cumulative Hatch Dates (2002-2004)



Results:

2004 Gourd Comparison

No significant differences in martin preference or nesting performance were detected between the three gourd types offered. Based upon hatch dates, the Supergourds and Naturelines as a whole were occupied earlier than were the Bo gourds but all the gourds of each type hosted martin pairs. Brood sizes initially average slightly larger in the ten Supergourds but very similar numbers of young were ultimately fledged.

Between Year Comparisons

In 2002 nineteen Natureline gourds were offered to the martins, all were occupied, one gourd suffering a failure of their eggs to hatch. The average brood size for the eighteen clutches that did hatch was 4.35 young per nest. No data was recorded that year pertaining to nestling weight, survival rates or fledging success..

In 2003 seven out of ten Carroll gourds and thirteen out of fifteen Natureline gourds were occupied for an overall occupancy rate of 80%. Eighteen pairs of martins hatched a total of 108 young for an average brood size of 4.9 young per nest. Only four nestlings are known to have perished before fledging, an average of 4.75 young being fledged per nest.

In contrast 2004 was a difficult year for the martin colony. Ten Supergourds, ten Naturelines and ten Bo gourds were put up and all were occupied. Brood sizes averaged only 3.72 per nest, significantly smaller than in 2002 and 2003. Mortality average 14% such that only 3.2 young were fledged per nest, again significantly less than 2003.

Eighty-eight approximately fifteen day-old nestlings were weighed in 2003, the average weight being 56.6 grams. In 2004 seventy-five nestlings similar-aged were weighed, the

average weight of these being only 47 grams. Hence the martins in 2004 produced smaller numbers of less well-fed nestlings.

Weather data was compared for the three years over a thirty day interval between April 15th and May 15th, this being the time when a majority of martins were raising their young. No measurable precipitation fell during this time period during 2003. In the other two years daily rainfall rates average 0.06 inches per day in 2002 and 0.09 inches per day in 2004.

In addition to being significantly wetter, 2004 was also significantly cooler than the other two years, temperatures averaged 72.61°F in 2004 as opposed to 78.39°F in 2003 and 83.45°F for the same time interval in 2002.

In as much as martins feed almost entirely upon flying insects, it is believed that the generally wet and cool conditions in 2004 contributed to the low nesting success of the martins in that year.

Conclusion:

The results tended to support our first hypothesis. The lowest average nesting success occurred in 2004 which was also the coolest and wettest year in the three-year study period.

However, the data did not support our second hypothesis. No significant differences in nesting success or martin preference were found between the three gourd types. All three gourd types (Bo, Natureline and Supergourd) performed approximately equally well.

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