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J. BARRY LOMBARDINI: EDITOR

CROCODILE LAKE NATIONAL WILDLIFE REFUGE A GOLD MINE FOR MOTHS AND HISTORY BY DAVID FINE AND HOWARD GRISHAM

GENERAL PHOTOGRAPHY BY DAVID FINE AND PLATE PHOTOGRAPHY BY CHARLES HOWARD GRISHAM JR.



Xylophanes pluto

Protambulyx strigilis





Erynnis ello

Pachylia ficus



Eacles imperialis



The Refuge is closed to the public as stated here on each of the power line poles along the 905



Ascalapha odorata



Eupseudosoma involutum

PREFACE

Few places have inspired and stimulated the authors in as many ways as has Crocodile Lake National Wildlife Refuge. A passerby driving South toward Key Largo to have some fun fishing or boating or diving would seldom know nor appreciate the deep history and significance that this hammock encompasses. One would never guess that this small strip of hammock has been the home both to a major US anti-missile assault military base and a very organized criminal cockfighting arena that did business for years, is home to several of the most endangered species in the USA,



Fig. 1. The 905 running between Crocodile Lake National Wildlife Refuge (left) and the Key Largo Hammocks Botanical State Park (right)

and has been the epicenter of major battles for land between environmental enthusiasts and large development corporations. The senior author (David), took the area for granted for years as he drove down for vacation after vacation with family and friends, totally unaware of the fact that this place was so very close to being destroyed just a few decades ago. Instead of becoming home to 40,000 more Floridians, today the northern half of the Island of Key Largo is home to the largest tropical hardwood hammock in the USA, containing over 100 different species of trees (Fig. 1). It also provides protected habitat to seven endangered species, and is a haven for many of the tropical species of plants, reptiles, birds, mollusks, mammals and insects that survive today in South Florida. The authors have spent thousands of hours rummaging through this unique habitat. While the focus has been on collecting moths, their lives have been enriched by this place in many ways. From this point on, you will join the authors on the journey that they have been on during the life of this project as well, and you the reader will receive a glimpse of the interesting history of North Key Largo and of Crocodile Lake

National Wildlife Refuge. Many obstacles have been overcome that could have ultimately destroyed this diverse habitat. It truly is a miracle that the park exists today!

The authors' purpose in writing this article has several facets:

- A) To describe and present the findings of our project including:
 - providing a description of moth population fluctuations in the Refuge in comparison to those of the City of Key Largo,
 - 2) presenting a species list of the moths we have collected in the Refuge.
- B) To pay a tribute to the Refuge by:
 - 1) summarizing the history of North Key Largo,
 - 2) describing how the Refuge came to be,
 - giving a description of the parks' unique endangered species as well as a list of some of the problem exotic species,
 - 4) pay tribute to a successful conservation effort put forth by the Federal Government and, especially, Steve Klett, the manager of Crocodile Lake National Wildlife Refuge.
- C) Give our story by sharing the history and origins of, as well as our future goals for, the project.
- D) Give a description as to how this project has blessed and enriched our lives.

HOW THE PROJECT BEGAN

David's journey in the Refuge began in 2002-2003 after the Miami Blue Butterfly (*Cyclargus thomasi bethunebakeri*) was seen on Bahia Honda Key after almost a 10 year span of time without a confirmed sighting. His initial effort was to search out areas where the butterfly had previously been found in hopes of finding more colonies. Once upon a time, the Refuge was home to this butterfly, where its larvae hosted on the seeds of balloon vine (*Cardiospermum corindum*). After personally walking up and down most every public street, vacant lot, parking lot and park in the Keys looking for this butterfly, he was satisfied that he had exhausted the possibility of the butterfly existing on public land. It simply was nowhere to be found. It was then necessary to begin surveying the Refuges and sanctuary areas of the Keys. One by one, David walked up and down paths and hammock edges, sifting through Ceraunus Blues (*Hemiargus ceraunus antibubastus*) and Cassius Blues (*Leptotes cassius*), carefully looking for the small red marking

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Fig. 2. Chlorostrymon simaethis ovipositing

on the ventral hind wing that signifies the Miami Blue. None were found.

This took David to North Key Largo along Highway 905, where there are about ten miles of Miami Blue habitat on both sides of the road. Balloon vine drapes the hammock edges in many areas along this highway. The East side of 905 is State-owned and is called *"Key Largo Hammocks Botanical State Park."* Within this Park is the historic Carysfort Circle where many of our old-timer lepping friends stated and confirmed they had seen Miami Blues in great abundance. This butterfly was actually a nuisance to these guys who were hunting the much more elusive Silver-banded Hairstreak (*Chlorostrymon simaethis*) (Fig. 2), which uses the same balloon vine host plant. Larvae of both species



feed upon the developing seeds inside the balloon seed pod (Fig. 3). The larvae look very similar and are tough to tell apart. A collector would pick pods containing frass pellets and place them in a container, waiting for the larvae to go through their life cycles. Reportedly, the Miami Blue larva is quite cannibalistic (or predatory in this case) and ate the hairstreak larvae in the container. David remembers one of his old-timer friends commenting: "*All I would be left with is darn Miami Blues and no hairstreaks.*" The tables certainly have turned, as the Silver-banded Hairstreak now is somewhat common locally, and the Miami Blue has disappeared except for a few small colonies on tiny islands in the Key West National Wildlife Refuge. Needless to say it was very exciting to survey this area.

Fig. 3. Chlorostrymon simaethis larva eating balloon vine seed

After probing into the legalities of doing research in this area, David realized how sensitive this habitat is. The park is off limits to the public unless one has special

permission to be there. One small area near the southern boundary of the park is accessible to the public. It was examined thoroughly without any signs of the Miami Blue but this site is several miles away from the Carysfort Circle where the blue was last recorded.

The senior author was invited one day to go on a seed-collecting trip with Jim Duquesnel who was the chief biologist for the State owned John Pennycamp Reef State Park. He was kind enough to share a few areas where he knew balloon vine was growing, to see if there were any Blues. However, all that were seen were Silver-banded Hairstreaks. While this was a disappointment, it by no means stopped David. The next step was to walk across the street to the west side of the road, to the federally-owned Crocodile Lake National Wildlife Refuge. At the Main Office, there is a trailer housing the office of Steve Klett, the manager of the Refuge. David met with Steve for about twenty minutes and Steve said that so long as there was no collecting, he would be welcome to take a look around. David found some areas where the hammock was covered with balloon vine. Several very healthy colonies of Silverbanded Hairstreaks were located but, alas, no Miami Blues. While the habitat was very much intact the same way it had been back in the 70's when the authors' friends were collecting there, apparently, for some reason, the Blues had disappeared.

Dr. Jaret Daniels and students at the University of Florida began a captive breeding program in Gainesville. They released thousands of captive bred Miami Blues at historic locations for the butterfly in Everglades National Park and the upper Keys, but they were not successful in creating new colonies. The authors had hoped that these efforts would be successful and the Blue's future would be secured. As an aside, the authors note with interest that historical records of the "*Miami Blue*" report that balloon vine is its chief food plant, whereas contemporary reporters indicate today's "*Miami Blue*" to utilize grey nickerbean (*Caesalpinia bonduc*) as they do in the colony in Bahia Honda Key.

In any event, assuming the Miami Blues to be in the best hands possible, the senior author began focusing his attention on some of the moths of the Keys. Larvae of *Eupyrrhoglossum sagra* had been first found in Florida in 1997 in Homestead by Wayne Miler according to Jim Tuttle in the Hawk Moths of America and adults (Fig. 4) in 1999 by Leroy Koehn who found in on Key Largo⁽²²⁾. Then in 2000, *E. sagra*, this small but beautiful sphingid that apparently had taken up residence in the Florida Keys from Cuba, was found by Leroy and David hanging on the walls

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Fig. 4. Eupyrrhoglossum sagra

of the Publix Supermarket near Mile Marker (MM) 101 in Key Largo. Leroy and David made over forty combined trips down to the Keys from Palm Beach County, during which time seven of these moths were found, all of which were resting on the walls of only one building. All of the surrounding gas stations and well-lit buildings never produced a single specimen. Why was this? The listed host plant is rough velvetseed (*Guettarda scabra*) which is a fairly common plant in the keys. Why was the moth not showing up in other sites or in light traps? Leroy and David noticed that the general moth collecting would begin to slowly accelerate in November and then explode in February, March and April, suddenly dying off in May and June. This was strange because between May and June is the time of year when moth populations typically begin picking up, not dropping off. This question was baffling to David as he continued

his frequent trips to the Keys trying to find these rarities. His counterpart, Leroy, wound up moving to Kentucky, leaving him all by his lonesome in South Florida when it came to serious moth collecting.

Another friend of the authors, Mark Walker, came for a visit one May for a few days and he and David spent some time in the Keys. They spent an entire evening driving around to different gas stations, convenience stores and other well-lit buildings, and the result was that only two moths were found all night, both being common species, Erynnis ello and Protambulyx carteri. This left them with a lot more time for fellowship than surveying. The next night while they were waiting for nightfall they decided to get some good fresh seafood (there is never a shortage of fresh seafood in the Keys). The two were at one of the popular restaurants on US-1 in Key Largo talking about how dismal the previous night had been, because just two weeks prior David had experienced a phenomenal week of collecting from the very same building walls, having found the following quantities and species of sphingids: 1 Pachylia ficus, 1 Pseudosphinx tetrio, 12 Protambulyx carteri, 4 Madoryx pseudothyreus, 7 Xylophanes pluto, 3 Xylophanes tersa, 3 Enyo lugubris, 21 Erinnyis ello, 2 Erinnyis obscura, and 11 Cautethia grotei. He had also found a beautiful Automeris io lilith (female), three different Melipotis species and a variety of other smaller species (2,15). Mark was from California and did not get to Florida very often, so he was naturally drooling when he heard the species' list of just two weeks prior. At that very moment they heard a loud sound and saw yellow flashing lights on a truck driving slowly along the roadside, dousing the foliage on the sides of the road with insecticide. The fog lingered in the still air for several minutes before settling. The two looked at one other and had a feeling that they knew exactly why the collecting during the summer months had become so slow.

Mosquito control in the Florida Keys makes life livable and comfortable, as well as safe from various mosquitotransmitted illnesses, for the tourists and residents in this tourist-driven economy that constitutes this part of Monroe County. Rummaging through the hammocks of the Refuge (where there is no spraying), there are times when one can literally be driven to insanity as a result of a bombardment of salt marsh mosquitoes (or to the blood bank for a refill – whichever need comes first). All of the Keys would be this same way if mosquito control didn't do its thing. The senior author (David) discussed his thoughts of how mosquito spraying could be an additional stress on the struggling Lepidoptera species in South Florida, with the main culprit being loss of habitat to development. (Please see "Spring Leps in Florida," Southern Lepidopterists' News, 2006)⁽⁸⁾. David also responded to the article: "A Letter to the Editor" written by Larry Hribar in the Southern Lepidopterists' News, 2007⁽¹⁴⁾, in which he went a bit deeper into these findings (please reference: "A Friendly Response to 'Letter to the Editor'" Southern Lepidopterists' News, 2007⁽⁹⁾, if you wish to read more). While it is not the authors' desire to discuss this issue in any greater detail, they feel they must report the basic findings of the experiment that has been underway for the past eight years, so they will leave this section of the article as brief as possible. Their hearts are torn as they report what they see. Although they certainly enjoy the fruits of mosquito control as well as agree with and endorse its operation, they do, however, feel obligated to the project to give an accurate account as possible to what they have seen.

THE EXPERIMENT

It seemed as though every time a trip was made to the Keys a new species of moth would be found that had not yet been seen. It began to become apparent that the moth fauna in southernmost Dade and Monroe Counties is far more extensive than previously thought. It was also seen that the identification of many of the moth species from South Florida can be quite challenging as there are no comprehensive books, guides or websites that one can easily refer

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to for identification purposes. This became the primary goal of the authors, *i.e.*, to create a photographic library of the species encountered in the Northern Keys. It was also observed that year after year of futile collecting in what is supposed to be the good time of year for finding moths (the summer months) made it apparent that if a moth survey was to be done in the summer months in Key Largo, this would need to take place on the Refuge pursuant to a permitted research project. It was felt that it would also be interesting to look at the population fluctuations in the Refuge, where mosquito spraying does not occur, and see how these coincided with those of the city where spraying takes place. These data do not include dates of actual spraying which is unknown to the authors rather the data place moth collecting dates in the general times of the year when mosquito spraying activity increases or decreases due to mosquito emergences.

The Method was to survey the city for moths as well as the Refuge on the same nights and record the number of larger species seen in the Refuge and in the city across several different years. We wished to find any kind of



Fig. 5. Key Largo City survey location #1, Circle K



Fig. 7. Key Largo City survey location #5, Fire Station near MM 99



patterns that might emerge if this type of study would be done for an extended period of time. Collecting in the city consisted o f surveying 7 different well lighted locations such as gas stations, shopping centers, fire stations and a hospital [Figs. 5-7. Also refer to the map of Key Largo on page11 with

Fig. 6. Key Largo City survey location #4, Publix near MM 101

designated Mile Markers (MM)]. These locations each contain 10's of thousands of watts of mercury vapor light as well as thousands of watts of fluorescent lights (in the case of gas stations and strip malls). These same 7 locations would be walked and it would be recorded how many species of sphingids were seen as well as the number of specimens seen. This would give us 2 data points per date surveyed: 1) number of species seen in the city, and 2) number of specimens seen in the city.

In the Refuge, there are no gas stations or other artificial lights so the authors needed to run their own. Equipment used consisted of 4 (15 watt) bucket light traps (battery-operated)(Figs. 8 - 10) as well as a generator-operated light rig consisting of 1 (1,000 watt) mercury vapor light, 1 (175 watt) mercury vapor light, 2 (40 watt) black light-



Fig. 8. Alan Chin Lee setting light trap at the cockfighting arena



Fig. 9. Fifteen watt bucket light trap set out in Crocodile Lake National Wildlife Refuge

white fluorescent tubes and 2 (40 watt) black light-black fluorescent tubes. These would be hung in front of a white bed sheet (Figs. 11 and 12, next page). Sphingid specimens were collected in the bucket traps for easy counting and the light rig would be manned as specimens would be collected by hand as they would come into the lights. This combined effort would give two data points per date surveyed: 1) number of species seen in the Refuge, and 2) number of specimens seen in the Refuge.



Fig. 10. Bucket of moths at Nike missile site

Fig. 11. Average number of moths present at light sheet at the missile site in the summer

It is recognized that this methodology is not perfect since:

- A) The system used for drawing moths in is not identical from the Refuge to the city.
- B) Many other unforeseen variables may play a role in species and specimen fluctuation on any given night.
- C) Dates are spread across 8 years of surveying which encompass many other variables such as hurricanes, droughts, windy nights *etc....*
- D) Several of the earlier years (2000 2003) are not represented in the Refuge data because the permit was not granted until April of 2004 leaving data in the city for those earlier dates without the comparison to species and specimens found in the Refuge because the study was not taking place there yet.



Fig. 12. David at light sheet in Nike missile site

All of this being said, with all the weaknesses and flaws of the study, as shown on the species/specimen graphs (pgs. 9 and 10) for the city and refuge, a very consistent pattern has emerged over 10 years of data that moth populations in the city suffer tremendously in the late Spring and continue to do so throughout the Summer months only to begin to show signs of recuperating in the fall while populations in the Refuge explode during the exact same time of year. Even with the flaws in the methodology, the steady nature of this statistic is quite undeniable and unambiguous.

Our Initial Hypothesis: A drastic downward spike in moth species and numbers of individuals in the city of Key Largo began in May, and populations continued to be low through the summer and early fall. This coincides with the time of year that precipitation levels are elevated

which leads to massive emergence of mosquitoes. Accordingly, this is the same time of year that mosquito spraying typically begins. Thus, we postulate that the spraying of these insecticides in residential areas is generally proportional to, and likely responsible for, the low numbers of moths in the city of Key Largo from the months of May through early October.

The Test: There are 7 locations in Key Largo city (where spraying takes place) which are perceived by us as good places to locate insects, consisting of buildings which have bright florescent lighting at night. These locations were surveyed on the same nights that our light traps were placed out in Crocodile Lake National Wildlife Refuge

where there is no spraying. We then would monitor the number of species seen as well as the frequency that various species would be found. These types of records would be kept throughout the year. Since the Island of Key Largo



Fig. 13. Mediterranean gecko on city walls eating my moths

is not very big, and natural variables (*i.e.*, humidity, temperature, precipitation) are relatively constant between the city and the Refuge, then the emergence of various moth species and abundance of these species presumably should be somewhat consistent. If there should be a drop off in moth activity in the city during the times of year when mosquito spraying is active and, precisely at the same time, the moth populations in the Refuge were to remain consistent or even increase, then one might reasonably assume that this spraying is partially, if not largely, responsible for this decline in moth populations in the city during these times. Largely, the species of focus were from the family Sphingiidae, for the specific reason that because of their large size, they would not be disturbed by the Mediterranean Geckos (Fig. 13) present at most all artificial lights in the Keys. Had we used smaller species as a gauge, the numbers would be skewed because the lights in the city display few smaller species for this reason: the geckos eat them as soon as they hit the wall! Here is a list of

the 22 species used in the survey: Pachylia ficus, Cocytius antaeus, Eumorpha labruscae, Eumorpha vitis, Agrius cingulatus, Erinnyis ello, Erinnyis alope, Erinnyis obscura, Phryxus caicus, Manduca sexta, Manduca quinquemaculata, Xylophanes pluto, Xylophanes tersa, Protambulyx strigilis, Madoryx pseudothyreus, Enyo lugubris, Cautethia grotei, Perigonia lusca, Eupyrrhoglossum sagra, Ascalapha odorata, Eacles imperialis, Automeris io.

The Results: Our hypothesis seems to be right on.

CITY LOCATIONS: Sphingiid species in the city are almost totally absent in the summer months; we rarely encountered a single individual. In fact, the junior author noted several nights in which the insect fauna present on lighted buildings consisted solely of one to three honey bees. In mid-to-late September, slowly, Sphingiid species began appearing at these locations, and gradually and more frequently were seen throughout the winter months, and into spring. This trend continued through the spring and peaked in March and early April with the greatest diversity and numbers of these species appearing at these times. Then, every year like clock-work, the appearance of all Sphingiid species declined dramatically to almost nothing and stayed like this throughout the summer. Many nights would yield zero specimens at eight locations and there was never a night during this time of year where we found more than three specimens at the city locations with the exception of June 16, 2004, in which 7 specimens were seen.

REFUGE LOCATIONS: The summer months yielded a good number of Sphingids and began a slow decline towards the end of August, and dipped to a low from October/November/December and the beginning of January. However, there were always numerous representatives of Sphingiidae present. In March, a drastic upward spike in the appearance of species as well as the quantity of many species occurred, and stayed on a strong upward incline, peaking in late June and early July, which proved to be the best times to collect them in every year of the survey.

The Conclusion: Generally, it has been the authors' experience that moths in tropical and subtropical habitats typically spike in emergence in direct correlation with elevated rainfall, which is also true with most mosquito species. At Crocodile Lake National Wildlife Refuge, where conditions are as natural as possible with a minimal disruption from human interaction and development, moth emergence and population fluctuations occurred in a perceived "normal fashion," rising and falling with precipitation levels. Just a few miles away in the city, while populations were exploding in the Refuge, moth populations plummeted to practically nothing and remained this way throughout the duration of the rainy season. These downward spikes in populations in the late spring and upward spikes in the late fall and winter are in direct contrast with "normal" moth population fluctuations, and coincide directly with mosquito spraying activity in the city. [See Graph 1 (page 9) and Graph 2 (page 10).]

Please Note Historical Precipitation Averages for Key Largo and how they correlate to insect emergence:

January: 2.2"	February: 1.9"	March: 0.7"	April: 1.2"	May: 3.0"	June: 6.0"
July: 2.0"	August: 9.6"	September: 7.7"	October: 12.6"	November: 0.4"	December: 0.7"

Therefore it may be reasonable to conclude, or at least to suggest, that mosquito spraying in residential areas in Key

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This study constitutes 57 trips to the Keys

Graph 1. The chart on the left above contain the collecting data for 57 different survey nights spent in Key Largo from December of 1999 through May of 2009. These dates are arranged in chronological order based on the day of the year (not taking into account the year for each date). There are obvious complications with displaying the graph in this manner not accounting for various different environmental changes that take place each year such as rain storms, windy nights, cold spells, hurricanes, droughts and so on. However despite the challenges of showing the graph with dates placed in order (disregarding the year), we still see a very clear pattern in regards to the species and specimen fluctuations in the city and how they differ drastically with those of the Refuge. Note that from May 1st through mid September, the specimens of Sphingidae collected in the city locations declines to zero for almost every date surveyed in the city for this time of year throughout the duration of the project. At this same time of year in the Refuge the average number of species seen goes from 5 or 6 up to 12 and 13 different species on a given night and the number of Sphingid specimens jumps from the norm in the 10's and 20's per night and starting in the beginning of May jumps up to the 40's and 50's and on June 20th, 2004, 72 specimens were collected in the Refuge in comparison to 1 specimen seen in the city that night. These patterns reverse from late September through the end of December and on through the rest of the winter and spring months up to the beginning of May. The line graphs on the right hand side give an easy visual aid in displaying the numbers from the chart on the left. This graph is shown again more fluidly on page 10 without breaks in the line graphs.



Graph 2. This graph represents 57 dates of surveying the Keys from December of 1999 through May of 2009. There are 4 data lines represented on this graph: 1) Refuge species, 2) Refuge specimens, 3) city species, and 4) city specimens - except for dates preceding April of 2004 when the permit for the Refuge allowed us to survey this site. Prior to April of 2004 only city numbers are represented. All dates are arranged in chronological order by the day of that month and each month shows all combined dates surveyed in that month over a 10 year period. Note the different trends in numbers of species and specimens in the Refuge and that of the city starting in late April and continuing through September and October. Refuge numbers explode in the Spring and die off in Fall while numbers in the city die off in the Spring and begin rising in the Fall. These trends reverse at this point and maintain this opposite trend until the following Spring.

Largo hinders the ability of many moth species to perpetuate in these residential areas during these times. It also appears possible that, as long as there are natural areas that are kept free from spraying activity, these same species thrive with little to no effect from the spraying that occurs just a few miles away. However, there certainly may be other important factors other than mosquito spraving that account for the differences in sphingid diversity and abundance such as placement of the light traps in the habitat, objects around the traps, etc. that we did not or could not control. Also we did not use the same methods in both the Refuge and city in that light traps placed in the Refuge were compared with buildings with florescent lighting. In any event, it appears to us that the species diversity that we have encountered during the project (300+ species) implies that through several decades of mosquito spraying in the city, this spraving has had very little effect on species on the Refuge. It is evident that as long as these insects are left with some sort of haven free of development and pesticides, even a sliver hammock like that of Crocodile Lake National Wildlife Refuge, they are capable of thriving. The authors have used what resources they have (the project being funded entirely by themselves) to evaluate other possibilities as to why these abnormal fluctuations occur in the city of Key Largo; however, it is realized the complex nature of what drives insect emergence, and follow-up work to explore other possibilities is certainly encouraged by the authors. What is amazing to see is that humans and South Florida's sensitive ecosystems can co-exist as long as these systems are given a haven to live without human interruption. Mosquito control provides Monroe County with the possibility of having a tourist-driven economy. Without mosquito control, only a very thick-skinned person would be able to live in the Florida Keys. It is also safe to say that the tourist industry would be drastically different than the thriving entity that exists today. One can only spend so much time IN the water! I (David) for one am grateful for the service that Mosquito Control provides for the residence and guests of Monroe County.

THE HISTORY OF KEY LARGO (23, 24)

(Much of the information described in this section comes from a collection of old Newspaper Articles that



Refuge Manager, Steve Klett had collected over the years. These articles created a fascinating angle to this project by providing a sense of history to the Refuge that would otherwise have come with many holes. Thanks to this collection of articles, the authors feel as though they have obtained a fairly thorough understanding of how and why the Refuge looks and is the way it is today. By sharing this information, the object is to give the reader a comprehensive picture of this area visually by providing some of the interesting photographs taken, as well historically as the reader can use imagination to put a picture to the fascinating stores told about this property over the past 200 years.)



Fig. 14. Typical hardwood hammock of North Key Largo

While driving along Highway 905, one passes mile after mile of dense mature hardwood hammock (Fig. 14). This appears to be one big continuous stand of trees with very little change of scenery. It is almost impossible to think that almost all of the growth is secondary forest. It is understood that almost the entire island had been cleared at one point or another to farm pineapples and citrus. This is one facet of North Key Largo's history that goes unnoticed today. The truth is that this island is rich in history.

Key Largo is 33 miles long (see Map on page 11) making it a very "long" island, but the total land area is only 14 square miles (~9,000 acres); this shows how narrow the land bridge is. The current population is almost 13,000 people. The island thrives almost entirely on tourism and has been given the nick-name; "the diving capital of the world." This is an accurate name, because just off the coast of Key Largo rests

John Pennekamp Coral Reef State Park, which contains the second largest living coral reef in the world behind Australia's Great Barrier Reef. This living coral reef stretches 22 miles down the coast of Key Largo and draws three quarters of a million visitors each year. On December 10, 1960, Governor Collins declared this park a wildlife preserve, making it the first wildlife preserve in the US to be 100% underwater. The name "*Key Largo*" comes from the Spanish words "*Cayo*" meaning "*a small island*," and "*Largo*" meaning "*long*." The island's geography consists of an exposed, fossilized remnant of a coral reef formed and then exposed during a period of the ice age. As sea levels dropped, the reef was exposed and then began to erode. This limestone substrate, called caprock, has been smoothed out over the years and has various pits, holes and crevasses in it which collected dead seaweed and other organic material. This decomposing material created a very rich, acidic humus soil. Near the coast, a limestone-based, slippery, gray clay called "*marl*" covers the rocky natural shoreline. The highest elevation is fifteen feet, with an average elevation of eight feet.

The Calusa Indians inhabited the Keys while Europeans were discovering the new world. Most of the Calusas left the Keys when the Spanish traded Florida to the British for Cuba in 1763. Seminole Indians moved in to fill this void. While it is rumored that there were small settlements in Key Largo prior to Florida becoming an official US territory in 1821, the first official land buyer in Key Largo was Samuel Lowe who purchased 900 acres, including what is now the Nike Missile site (the epicenter of our research). An 1880 census shows that Mr. Lowe lived there with his wife Euphemia, his son Benjamin, and two younger sons. Mr. Lowe was a pineapple farmer who used a "*slash and burn*" method of perpetuating crops every three years. This means that there was considerable deforestation at the time. At this time in history, 85% of the pineapples sold in the US came from the island of Key Largo.

Another farmer on the books is a John Whalton who had a farm and garden on the Atlantic coast of North Key Largo in 1826. He and his family owned a home in Key West but lived on a large boat that they docked just off the Key Largo shore. In June of 1837, while Captain Whalton was coming on shore, he was killed by Indians. This was during the "Second Seminole Indian War" (1835-1842). His family returned to their house in Key West.

Found in the 1896 census is a Thomas Lowe and his son Matt living in North Key Largo. Their occupation is listed as *"fishermen, catching turtles, collecting sponges as well as farming pumpkins and melons as well as raising bees for honey."*

At this time, life in Key Largo was very rustic. There were no schools, post offices, or doctors. There was no rail way or even roads connecting them to the mainland. Since there is no fresh water nor running water, drinking water

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was collected from the rooftops and stored in cisterns and 50 gallon whiskey barrels. Cooking and light was provided by kerosene, and people bathed in Dispatch Creek (a saltwater creek). Services were provided from the mainland *via* sailboats passing by. A small, homemade boat named "*Dispatch*" would row out to meet the sailboats. This small boat sunk after only a few short years of running. In the early 1800's Carysfort Lighthouse was built. In 1838, its lighthouse keeper was killed by Seminole Indians.

In 1908, when the rail service was completed, life became a bit more bearable for residents there. Then, in 1928, State Road 4A was completed and one could drive from the Florida mainland all the way to Key West on a two lane road and with the help of two ferries. This facilitated an explosion of development over the next several decades. Key



Fig. 15. Remnants of old homestead deep in the hammock. Probably was vacated after the hurricane in 1935

Largo at this point was still largely a farming community producing pineapples, Key limes and grapefruits. Key limes are smaller and a bit more sour than the Persian limes that we buy in stores today. Once these Persian limes were introduced to the US market, the Key limes market was doomed. Key lime pies are one of the only things Key limes are used for these days and oddly enough, there are, to our knowledge, no Key lime farms in the Florida Keys anymore. A majority of Key limes come from citrus farms from Palm Beach County – North. On Labor Day of 1935 a big hurricane came through the Keys, washing out most of the crops and destroying many of the settlements, killing hundreds of people. This hurricane, in combination with competition from other areas, began to doom the farming lifestyle of land owners of the Northern Keys (Fig. 15).

In 1912, W.A. Scott of Fargo, North Dakota, bought what is now the Key Largo Angler's Club. He built a two story, coral rock house which still stands today as part of the dining

room. President Hoover vacationed there for fishing trips and is on record quoting an ancient Assyrian tablet (2,000 BC) – "*The gods subtract from the allotted span of men's lives, the hours spent fishing.*" His passion for fishing in the Keys is most understandable and, while his quote may have been in jest, David could almost agree with the Assyrians. After all, most of the Apostles were fishermen you know! The love of GOOD fishing seems to be a common theme! The only thing that draws David to the Keys more than the unique Lepidoptera is the amazing fishing. This exposed coral reef is a rocky ridge of a very shallow flat that produces very calm seas making for some absolutely amazing visual experiences. More often than not, the ocean and bay views of the Florida Keys seem to be as calm as bath water, making this a perfect place for shallow-water fun like boating, skiing, snorkeling and diving as well as kayaking and, as the area is often a place void of city noise and light pollution, it is our considered opinion that Key Largo is a "*paradise on earth*."

While millions of people visit the Keys each year for its paradise(ish) outdoor water activities, a multitude of ocean life species share the same sentiments. These shallow-water grassy flats and mangrove bays create a perfect fish nursery. Many individuals of South Florida's fish species begin their lives in these flats, hiding in the warm, shallow, grassy waters of this 130-mile stretch of shallow-water islands. The Florida Spiny Lobster shares this nursery with the fish species. It is a common sight in rocky bays, docks and marinas to see dozens of long whip-like lobster antennae sticking out of the holes in the rocks. This nursery helps to feed all of Florida with its lobster. As they outgrow the shallow-water holes, they begin to walk offshore to find more suitable cover. Each summer, the minilobster season occurs, which is a two day free-for-all for amateur lobster fishermen after several months of a closed season in which no harvesting of Florida lobster is permitted. This is a time that is allotted to the amateur prior to the opening of the commercial lobster, they probably will not want to be there during this time (typically in August), in that the Keys turn into a human zoo. People from all over the world come to partake in the rich lobster resource that the Keys provide at this time, thus making it essentially impossible to find a hotel room (or for that matter any place to stay) anywhere in the Keys.

Wherever there are small fish there generally exists an equally impressive number of larger predatory fish. Fish species such as snook, tarpon, redfish, sea trout, bonefish, permit, barracuda, jack crevalle, numerous shark species,

snappers, groupers, mackerel (and the list goes on and on) are present in large numbers in the Florida Keys, making it one of the hottest fishing locations in the USA. If you decide to get a line wet in the Keys, hold on!!!! It's only a matter of time (usually a short time) before one of these sea monsters takes you for a ride!

Getting back to history, in 1942 land was bought for what is now the Ocean Reef Club, a very prestigious golf/fishing country club accessible only to private members and their guests. This property is on the northernmost boundary of Key Largo locked away miles from civilization, making the elusive nature of the club an attractive thing for its citizens. In 1942, the club began as Dispatch Creek Fishing Camp. At this point it was accessible only by a dirt road and was very rustic. It wasn't long before docks were built, channels dredged for access for larger boats, land filled in for development, a golf course was built, and an air strip added. Soon the club was accessible by boat, land and air. Today, the Ocean Reef Club is a thriving community which is unique in the sense that out of all the developments that were proposed for North Key Largo in the 70's and 80's, it is the only one that was built and still survives.

THE NIKE MISSILE SITE (19, 25)

Much of the information content of this portion of our article was found in the reference article "*The History* of the Nike Hercules Missile Site in Key Largo, Florida" written by 1st Sergeant "*Top*" Edward Peterson U.S. Army, Retired, and Staff Sergeant Charles D. Carter, Military Historian, and was presented at an event held at the Key Largo Public Library on January 13, 2003.

Located in the heart of Crocodile Lake National Wildlife Refuge lies a gravel road with a huge chain link fence with a big padlock blocking would-be travelers from driving back into the hammock to explore. On the other end of this path lies one of North Key Largo's best kept secrets. One might never guess that at the other end of this path was a full scale US Army base used as a defensive post armed with Nike Hercules Missiles to defend South Florida from nuclear attack during the Cuban Missile Crisis. The site was officially closed in June of 1979, but relic buildings, bunkers, and missile launch pads, all covered with vines and vegetation, are still present there and have provided enough cleared area to efficiently run light traps. Because of the cleared area at this site, moths can detect the light from much further distances, thus making this site by far the most effective collecting location. Almost the entire rest of the park consists of dense hardwood hammock, making collecting much less productive. The following is a brief history of events that led to the creation of this Army Base.



Fig. 16. Vintage public release photo of a Nike Hercules missile, July 15, 1958

The "Cold War" began in February of 1945 at the Yalta Conference in the palace of Czar Nicholas. Stalin's army was the largest in Europe with 12 million soldiers in 300 divisions (compared to Eisenhower's 4 million men in 85 divisions). The press in the US was becoming more and more critical of Russia because Stalin refused to hold free elections. As criticisms flared back and forth, the threat of war intensified. During the Cold War, there were major efforts to develop surface to surface defensive missiles and bomber intercepts. One of these projects was called Nike after the Greek goddess of victory (Fig. 16). This project contained 240 missile sites in the US, employing 45,000 National Guard soldiers. These sites were controlled by the Army Air Defense Command (ARADCOM) and were active throughout the administrations of President Truman all the way to President Ford. In 24 years, there was never an attack on US soil, thus arguably justifying these sites as an effective deterrent. The Nike missile system

began in 1950, was operational by 1955, and was the first ground-based anti-aircraft missile. In 1958, the missiles were modified to use solid fuels, thus making the missiles much more versatile, and they were then renamed Nike Hercules missiles. The Nike Hercules missile was used to protect Washington, D.C., ports and industrial areas, atomic weapon-production facilities, and strategic-command air bases, from attack. This program was one of the first steps that led to the Patriot Missile system.

The Nike missile was 41 feet in length, had a wing span of 6 feet 2 inches, a diameter of 31.5 inches, a range of 75 miles, and an altitude capacity of 150,000 feet. It weighed 10,710 pounds and traveled at speeds up to 2,707 miles per hour (mach 3.65). Missiles were stored under-ground and were brought to the surface by use of an elevator.

They were placed at an 85-degree angle for firing. Control equipment was ground based and located at least 1000 yards away from the missile.

The following is a chronology of the Cuban Missile Crisis:

- 1960 Khrushchev meets with Fidel Castro and promises to support Cuba.
- January, 1961 President Kennedy states "hands off our hemisphere" in his inaugural address.
- April, 1961 The Bay of Pigs incident heightens tension.
- September, 1961 USSR tests a 50 megaton Hydrogen Bomb which at this time was the largest ever, thus new strategies must be developed to protect the USA.
- October, 1961 Khrushchev ships troops, arms and missiles to Cuba.
- October, 14, 1962 Photos taken show Soviet missiles in Cuba.
- October 15, 1962 Photos are shown to President Kennedy and a debate ensues discussing options of: 1) Invasion, 2) Surgical Air Strike, 3) Naval Blockage, 4) Negotiate to remove missiles.
- October 18, 1962 USSR claims that the missiles are defensive.
- October 19, 1962 New photos were taken of larger missiles forcing President Kennedy to blockade.
- October 22, 1962 President Kennedy orders naval quarantine and announces on national TV that the Soviets had nuclear capability with range of attacking New York and Washington D.C.
- October 26, 1962 KGB threatens US, "Let's not pull on the rope."
- October 27, 1962 "Black Saturday": The Kremlin sends a message "remove missiles from Turkey." The U.S. continues to prepare for invasion anyway. A U.S. pilot is shot down over Cuba. Later that day, Robert Kennedy met with the Soviets to propose a deal. The US will privately withdraw missiles from Turkey if USSR missiles in Cuba are withdrawn. President Kennedy vowed to not invade Cuba if this happened. President Kennedy gave the USSR 48 hours to remove the missiles or the US would attack as planned.
- October 28, 1962 USSR accepts offer thus ending the Cuban Missile Crisis.
- November, 1962 Soviets begin dismantling their missiles. President Kennedy comes to South Florida, presents soldiers of this missile site (at that point located on the Florida mainland) with the prestigious "*Presidential Meritorious Unit Citation*." President Kennedy states that the presence of these men and the missiles forced the Soviets to back down.



Fig. 17. Nike missile site building rubble

Fig. 18. Nike missile site bunker hidden in the hammock

In less than two weeks the Cuban Missile Crisis was over, but this crisis prompted the US to further develop our missile defense systems. Thus, the Nike Hercules site was moved from the Florida Everglades and built on Key Largo. The site is located on Highway 905, three miles south of what is now the Ocean Reef Club. The administrative portion of the missile site was located on the east side of the road in what is now Key Largo Hammocks Botanical State Park. The launch pad was placed on the west side of 905 in what is now Crocodile Lake National Wildlife Refuge. Twenty-four men where on high alert and maintained twelve missiles with high explosive warheads on them. No nuclear warheads were brought to Key Largo. On February 4, 1974, the army ordered that all existing Nike missile batteries be inactivated. The site in Key Largo officially closed down in June of 1979.

Today, the plans for the Nike Missile Site area are basically to allow it to fill in with vegetation and eventually become hardwood hammock again (Figs. 17-20). Several acres of concrete pad were removed and concrete buildings were torn down in a \$77,500 recovery project. The site lies dead smack in the middle of the habitat for three of Florida's rarest and endangered creatures: the Schaus Swallowtail, the Key Largo Cotton Mouse and the Key Largo Wood Rat. By allowing these cleared areas to fill in, the idea is that this will facilitate a more natural setting for these creatures



Fig. 19. Nike missile site bunker entrance



Fig. 20. Inside the Nike missile site bunker

to breed in natural conditions and habitat. It has been considered a privilege to be able to have access to and explore this site. As one drives down the overgrown paths, passing by the remnants of now vine-covered military buildings, underground bunkers cut out of the side of berms built to protect troops in an attack, and overgrown, weedy missile launching pads, one cannot help but allow his imagination to go wild pondering the goings-on that took place here. The site in its current state creates a fascinating sensation, almost placing one (in one's imagination) in a movie scene where some tragedy overtook a location. "*Ghost town*" is a concept that comes to mind. It is rare, at least in a place like South Florida with such an elevated real estate value, to see a place of such obvious previous human activity, untouched for several decades. This experience has added to our survey in a very special way for us, as we will be able to tell these stories of what we have seen and learned here for years to come.

NORTH KEY LARGO CITY (3-7, 10-13, 18)

One would think that with the military action going on in North Key Largo in the late 60's and early 70's on the heels of the Cuban Missile Crisis, the last thing on people's minds would be to start a huge "city of the future" development project with this land (map pg. 18). However, at the same time the Cold War was threatening, a huge development craze was beginning, and condominium builders had their sights on North Key Largo. In 1975, the State of Florida declared the Keys as an Area of Critical State Concern (ACSC), in an attempt to protect the environmental gold-mine that had been discovered. This designation, however, only does any good when it is enforced. There were a few years in the late 70's and early 80's when government officials seemed so eager to develop, that the ACSC designation meant little: huge condominium plans were rushed through commission hearings, and the clearing of mangroves and hammock as well as the dredging of channels and marinas began very prematurely before any real environmental evaluation took place. It could almost be looked at as an "act of God" that this hammock still stands today, for it was literally days away from becoming a concrete extension of Metropolitan Miami-Dade South Florida.

North Key Largo consists of 12,000 acres of hardwood hammock and mangrove wetlands. In the 1940's a man by the name of N. R. (*"Tubby"*) Field bought 1,500 acres of North Key Largo for practically nothing. By 1955, he had it incorporated as a city. In the 70's the entire Florida Keys' population was 65,000 people. The zoning board proclaimed that the Keys could support twice that many people and Field projected that by 1989, 100,000 people would be living in Key Largo alone. One could almost consider the man a prophet, because in the late 70's and early 80's there were at least 15 major condominium, hotel and luxury home projects approved for North Key Largo, providing homes for at least 45,000 new residents. Subsequent to the ACSC designation of the Florida Keys, 51 major developments have been approved for construction.

The largest proposed project was named "Port Bougainville." It, along with "Ocean Forrest" and a few others,

would encompass this new city. In 1973, several Miami developers envisioned this \$2.5 billion "*city of the future*" in North Key Largo to house 35,000 people and include a heliport/airport, hydrofoil base, golf course, a monorail nearly as long as Disney World's, three marinas and ten health spas.

Port Bougainville was to be a \$500 million, 406 acre, 2,800-unit development in North Key Largo. It only took the Monroe County Commission 1 minute and 54 seconds to discuss and approve the project. By law, these plans were supposed to have been sent to and approved by two state agencies but this did not happen. The plans were never fully reviewed by Monroe County, the State of Florida or regional planners. In fact, these agencies never saw the plans until Herald reporters showed them copies. Construction had begun immediately. A club house was built, as were a few condos as well as 362 boat slips, until financing dissolved and the project died. In 1980, a company called DMI took over the project with a new plan making a few accommodations, including reducing condo height from seven stories to only four. Official plans were submitted in May of 1981 and approved by the Monroe County Commission. This new plan would, however, double the number of man-made lakes, and contain 80 buildings instead of 57. The plan also included the carving of four bayletts out of the hammock. The new developer offered to build a new fire station, pay for the four-laning of Highway 905, as well as help finance an Upper Keys Airport.

Since Key Largo does not contain sufficient fresh water for the number of inhabitants, it must be piped in from the Miami-Dade Aquifer at Navy Wells wellfield in Florida City. This presented a huge problem for all of these would-be developers, since the existing waterline coming into Monroe County could not support all the new development. In July of 1982, the Herald printed a story about a \$1.7 million tax-payer funded pipeline that was laid in North Key Largo, with the capacity of pumping three million gallons of fresh water to Key Largo each day. It was stated that the line was built for the residents of North Key Largo. However, outside of the reef club, North Key Largo was populated with just over 200 residents living mostly in trailers and single-family homes, and the common consensus from the people for which it was supposedly built was to the effect that "*they didn't want it*," and the Ocean Reef Club folks said that they "*didn't need it*." Nevertheless, the pipeline was built in record time; however, it turned out that it was laid on the wrong side of Highway 905, being inserted on the west side of the road, thus causing some potential problems for the breeding grounds of the endangered American Crocodiles. Even though these people said that they didn't want the pipeline, they wound up paying for it! Even though they had made their voices heard in protest, the pipeline was built. In any event, one thing that is known for sure is that the 20,000 planned homes for the area could not be built if the line was not present for the purpose of water supply.

On August 3, 1982, officials moved to block the enormous project, to finally have it reviewed by the proper agencies, and the next day the developers agreed to stop the construction of Port Bougainville, and to submit plans for review. Lawsuits followed and the project essentially ended in July of 1984 when the lender of the project, Continental Illinois & Trust, called the \$54 million dollar loan in default (this had originally been a \$180 million line of credit). This brought construction to a halt and Port Bougainville became a lost cause.

Port Bougainville wasn't the only project that ended on a shady note. "Ocean Forrest" was to be an 11,000 condominium development right in the middle of what is now the Refuge. The developers conducted illegal dredging from 1972-1974 and no action was taken until 1979. Their permit only allowed for channels to be dredged to 5' deep but they were dredged anywhere from 14' to 25'. The "Ocean Reef Shores" development created an illegal manmade land mass in the sea. These developers were ordered to stop construction, and when it continued, the federal government seized bulldozers, backhoes, rock cutters, trailers and whole drillers parked at the site. Eventually they were ordered to restore the habitat. The "Carysfort Yacht Club" critically over-dredged a boat basin (37' deep). Land dredged this deep can cause the entry of hydrogen sulfide into the water, creating toxins for aquatic life resulting in fish kills, a horrible smell, and very bad hydrolysis, causing rust to appear on metallic items in less than a day. The Club was ordered to bring in 200,000 cubic yards of fill to bring the depth of the basin up to 9'. "Sunland Estates" illegally dredged in wetlands in 1972 and destroyed mangrove hammocks. The "Key Largo Beach and Tennis Club" was also cited for illegally bulldozing mangroves. We understand that even the prestigious Ocean Reef Club that still exists today reportedly ran into some issues with "dredge-and-fill" laws as well as violations of water-quality codes.

There are several major steps one must take when developing in the Keys, including:

- Consult with the County's zoning office to see which ordinances are applicable. If the property is
 more than five acres and has more than six units, it is now placed under the "major development
 category."
- 2) An advisory meeting must take place between developer and County planners.

- Engineer and attorney must submit two detailed studies on likely effects on existing environment and public services.
- 4) The plans must go before the County Zoning Board for a final review.
- 5) Developmental procedure must comply with "critical concern law" in the Florida Keys. The county must send copies of approved site plan to the State Department of Veteran and Community Affairs and to the State of Florida Regional Planning Council. Either agency can appeal the zoning board's approval if this action is deemed necessary.
- 6) If there are no appeals, the land owner can take the building plans to the Monroe County Building Department to request land clearing permits.
- 7) If the plans include the clearing of wetlands, or are near open water, special permits must be obtained from the State Department of Environmental Regulation and the U.S. Army Corps of Engineers.

This process, if carried out, is very strict, time consuming, and labor-intensive as can be seen from the above list of rules. One can see how developers would be tempted to cut corners in getting their projects pushed through and completed in a timely manner. The ACSC designation is temporarily protecting the Keys' last remaining natural areas from irresponsible development. However, there are currently movements within the State and the County seeking



Proposed City of the Future

Fig. 22. Card Sound bridge during bike race

the deregulation of Monroe County from being classified as ACSC. The future of this unique ecosystem will forever be in the hands of its governing bodies. The senior author has always been an advocate of personal respect and responsibility towards the environment, but in cases like the Keys where there are so very few natural areas left, a responsible government clearly is always needed to pick up the slack where irresponsible neighbors and other persons might otherwise drop the ball.

THE COCKFIGHTING ARENA (1)

As the Cold War was winding down, and in the middle of the scenario of land being bought and sold in hopes and dreams of a huge metropolitan city, there thrived an illegal business in North Key Largo that few people knew anything about. Just a few hundred yards north of the Nike Missile Army Base stood an air-conditioned, steel-framed rink tucked back 100 yards off of Highway 905 behind the dense hammock, which was the home of a major gambling arena that housed rooster fighting. When two roosters are placed within close proximity to one another the result is

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a brutal fight that usually ends in the death of the weaker bird. Before the fight, patrons typically view the various birds in glass cages and place their bets on the ones they hope and think will win. Affectionately called "*The Chicken Ranch*," this site held weekly events, conducted entirely in Spanish, for nearly ten years, almost totally unbeknownst to law enforcement. It was complete with a guard at the front gate and a full concession for visitors.

A Florida Game and Fresh Water Fish Commission officer named Larry Lawrence was driving north on Highway 905 one afternoon in 1987 when a red Ferrari flew past him at 100+ miles per hour. He gave chase but the Ferrari pulled way ahead of him. He did see the car pull off to the left, onto a small dirt road up ahead of him. Larry followed him in and found himself before a guard who waved him past and into the complex. Larry knew something wasn't right about this so he left without raising any flags so he could tell the proper authorities. Hispanic undercover officers were enlisted to witness the goings-on. It took only one visit for the undercover policemen to see everything that they felt necessary to set up a sting operation and hopefully make some arrests. Accordingly, they set a date and time to address the activity and make arrests. However, on the date set for the sting operation, no persons appeared at the arena, the cover having obviously been compromised. In any event, this marked the end of the activity of the "*Chicken Ranch.*" The building is now gone and all that exists is the clearing in the hammock, a chain-link fence, and a small dirt path that is now used as access to survey wood rats (and now moths as well!).

THE REFUGE (26)



Fig. 23. Abandoned road closed to public access in Crocodile Lake National Wildlife Refuge

Crocodile Lake National Wildlife Refuge was declared a refuge in 1980 primarily to protect the endangered American Crocodiles living there. At that time, the Federal government already owned 80% of the land. Land acquisition became the greatest agenda for the Fish and Wildlife Service and a \$400,000 grant was given to purchase land along Highway 905 for the Refuge. Landowners at that time were not confronted with the threat of displacement via eminent domain, as land was bought solely from willing sellers. \$80,000 dollars of this money was used to purchase a trailer park and the money paid to the owners of the trailers as a down-payment to purchase a "higher priced dwelling." After the trailers were purchased, vandals moved in and destroyed most of them, essentially causing them to be unmarketable. After this vandalism, and also in combination with damage from Tropical Storm Mitch, Refuge manager Steve Klett elected to attempt to give them away. However, when potential takers saw how much work was needed to restore the trailers and realized how much money it would cost to transport them, most of them backed out. In the end, Fish and Wildlife paid for most of the trailers' removal and the rest was generously given from Mr. Klett's own pocket. Some of the trailers were given to Victory Outreach Church in Miami, where they were used for the church's drug and alcohol rehab programs. Today the Refuge stands void of human activity with the exception of the active waste transfer station. Except for the occasional guided tour, the Refuge is generally not open to the public. With the exception of the waste

transfer station property, the entire stretch of land west of Highway 905 has been bought back by the Federal Government and is now being allowed to revert into natural habitat. Almost all buildings and other man-made things have been removed to facilitate an environment takeover to be as natural as possible for the endangered and other species dwelling there (Fig. 23).

ENDANGERED ANIMALS (20)

The Refuge is home to seven endangered species of animals: the Key Largo wood rat (*Neotoma floridana smalli*), the Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*), the Schaus Swallowtail butterfly (*Heraclides aristodemus ponceanus*), the American crocodile (*Crocodylus acutus*), the Stock Island tree snail (*Orthalicus reses*), the southern bald eagle (*Haliaeetus leucocephalus leucocephalus*), and the indigo snake (*Drymarchon corais couperi*). This article would certainly not be complete without a discussion of a few of the key endangered species that make Crocodile Lake National Wildlife Refuge so special.

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Fig. 24. Road kill crocodile

The American crocodile (*Crocodylus acutus*) grows to lengths of up to fourteen feet, but typically gets no larger than six. It feeds predominantly on fish, birds, turtles and raccoons. These crocodiles are considered to be less aggressive than alligators. In fact, there has never been reported a confirmed attack by this crocodile on a human in Florida, the tendency of the beast being to keep itself well clear of human populations. There was one report of a croc killing a four year old golden retriever on April 20, 2006, on the 17th green of the Ocean Reef Club's golf course. Reportedly, the dog's owner would allow "*Buck*" to jump into the water to play . . . This type of encounter is obviously inevitable as human populations come in contact with dangerous wildlife.

This croc ranges from Venezuela north to Tamaulipas, Mexico, as well as South Florida, with individuals reported

as far north as North Carolina. The species was once common in the Miami and Fort Lauderdale areas, but as human populations grew, the croc populations dwindled. There were only twelve known breeding females in South Florida when the animal was placed on the US Endangered Species List in 1975. Throughout the 1980's there were as many



Fig. 25. Schaus Swallowtail (Heraclides aristodemus ponceanus)



Fig. 26. The Schaus Swallowtail is one creature that can access the missile site whenever it wants as this male is doing while patrolling the road leading to the site

as twenty nests found per year and presently there are as many as fifty confirmed nests per year. The crocs have made a fairly strong comeback with there being upwards of 800 individuals in the wild now. One of the reasons that crocs have struggled in the past is due to the unique habitat needed for nesting. Sandy, soft shorelines are required for nest-digging, and most of the northern Keys and southern mainland's brackish water coastlines are either thick mangrove hammocks. limestone or presently hotel/condominium boat docks. Ironically, all the development activity in the northern Keys during the 70's and early 80's actually helped the crocs because the sand that was dredged up to create channels and marinas was placed on many of the shorelines of the Refuge area, creating perfect breeding locations for the crocs. Now, as this unnatural sand is eroding year after year, the future nesting possibilities for the crocs are being diminished. In

8 years of spending time in the Refuge, the authors never saw a crocodile and thus were never able to photograph one, granted they were not canoeing down the banks of salt marshes. They have many struggles aside from the lack of breeding grounds. Traffic along Card Sound road and the 905 is a big threat for crocodiles that choose to cross the road (Fig. 24). Time will tell whether the American Crocodile is adaptive enough to survive in Florida with our growing human populations.

The Schaus Swallowtail (*Heraclides aristodemus ponceanus*) (Figs. 25 and 26) is an amazing butterfly and was one the senior author waited a very long time to see. Limited in its range to only North Key Largo and Elliot Key, this is not a butterfly one runs across very often. David's first encounter was in May of 2003 in a field next to the Publix parking lot on mile marker 101 in Key Largo. The specimen was visiting a native lantana flower. Years 2003 and 2004 were good for the swallowtail. In 2004, Alan Chin Lee and David witnessed several males

patrolling the path leading out to the Missile Site and observed upwards of ten adult individuals as well as over a dozen larvae on Wild Lime (*Zanthoxylum fagara*) while searching the hammocks for moths. It was surprising to see how this swallowtail appeared very comfortable flying in the deep shadows of the hammock, in contrast to most butterflies that prefer the sunlight. The slow lazy flight almost showed a sense of pride as they danced in and out of trees and bushes. However, 2005 disappointingly showed only one specimen in three trips to the hammock during the adults' flight period and we have not seen one since (in fact, Howard has yet to observe this species). Granted, our focus is not looking for butterflies and little time is spent in the hammocks during daylight hours, but the butterflies were clearly present as they crossed David's path during the 2003/2004 years. For more on the current status of this butterfly, please refer to *Southern Lepidopterists' News*: Minno, September, 2010.

The endangered Key Largo wood rat (*Neotoma floridana smalli*) and the Key Largo cotton mouse (*Peromyscus gossypinis allapaticola*) are rodents worth mentioning. They are extremely difficult to study, for they are completely nocturnal and have become very rare. In the 1980's, when the wood rat was added to the endangered species list, there were an estimated 6,500 individuals. Some of the more recent surveys show a discouraging 170 individuals. While no one knows exactly how many there really are, it appears certain that, along with habitat fragmentation, the introduction of exotic species such as fire ants, Burmese pythons, feral cats and the black rat, survival has become very difficult for these species. A tremendous amount of work has been done to try to preserve these little guys, including a breeding project at Walt Disney's Animal Kingdom of all places. In the first year of the breeding project, there were sixteen individuals taken from the wild which produced fourteen offspring. Efforts are presently underway to create artificial nesting locations in the Refuge using rocks, old jet-ski shells, and the like – it cannot be said that nothing is being done to save these cute little guys. They are a constant focus at the Refuge, bringing in researchers basically all year long in their attempts to learn as much as possible about the rodents, to give them the best possible shot at survival.

EXOTIC SPECIES

Compounding the stress pertaining to the endangered and other species on the Refuge are problems associated with the exotic species also residing there. Plant species such as Brazilian Pepper (*Schinus terebinthifolia*), Australian Pine (*Casaurina equisetifolia*) and Lead Tree (*Leucaena leucocephala*) have an extremely strong tendency to overtake a habitat by simply outgrowing their native competitors and choking everything else out, thus quickly changing a landscape. If corrective human intervention does not take place, these plants may eventually take over, potentially, completely destroying many native habitats. This has already taken place throughout much of Southern and Central Florida, where these plants have proven to be almost impossible to eradicate once established. With a consistent plant removal program however, they can be contained.

Fire Ants (*Solenopsis wagneri*) have been blamed for much mayhem with local native animals including butterflies, moths, birds and so on. They certainly pose a potential threat to nesting rats, mice and immature butterfly and moth larvae. Feral cats are always a problem for native birds and rodents, and have certainly played at least some role in the demise of the wood rat and cotton mouse. Cuban Tree Frogs (*Osteopilus septentrionalis*), Cuban Night Anoles (*Anolis equestris*), Brown Anoles (*Anolis sagrei*) and Mediterranean Geckos (*Hemidactylus turcicus*) are exotic reptiles that are common in Southern Florida and certainly make a dent in local Lepidoptera populations. Although the effects of their predation upon native species has not been quantified, the authors can confirm that geckos and tree frogs surely make collecting smaller moths and other insects at building lights on Key Largo difficult. They are certainly much more diligent collectors than we are!

The most recent exotic species that has caused quite a stir is the Burmese Python (*Python molurus bivittatus*). Over 1,400 pythons have been removed from the Everglades since 2002 and several have been removed from Crocodile Lake National Wildlife Refuge. The wood rat and cotton mouse are probably prime targets for smaller snakes, and the types of places the rodents require for nesting likely create convenient hiding places for the pythons. Commonly reaching lengths of over ten feet the pythons cause a threat not only to rodents, but just about anything that moves that is smaller than they are, including the occasional alligator!

With the exception of some python trappers that have been assigned to the Refuge snake problem, Refuge Manager Steve Klett is solely responsible for exotic animal and plant removal. Things look pretty good, as the exotic plant species have largely been removed or contained, thanks to Steve's daily patrolling of the roadsides, looking for fire ant mounds and other exotic species issues. It is a constant job keeping up with these pests but Steve's diligence has created as stable a habitat as possible for the endangered gems that dwell here.

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Fig. 27. Steve Klett, Manager of the Crocodile Lake National Wildlife Refuge, enjoying an evening of fellowship at the Buzzard's Roost with Howard, David and David's father, Larry

Steve Klett (Fig. 27) is the first and only manager of Crocodile Lake National Wildlife Refuge since its inception in 1980. He is the only staff member, leaving him quite a massive responsibility. Along with the administrative responsibilities necessary to maintain the Refuge, he also serves as the patrolman, protecting the Refuge from poachers, vandals, trespassers and the like. He is the exotic species removal specialist and endangered species expert. Steve also coordinates volunteer efforts and leads biological specialists who study the plants and animals at the park.

Steve was born and raised on a cattle ranch in Colorado. He attained his B.S. degree in Wildlife and Biology at Colorado State University and his Masters in Population Biology at Southeastern Louisiana University. He has worked in Refuges in California, Colorado, Louisiana and Florida spending the last 29 years working for the U.S. Fish and Wildlife Service. Steve lives very close to the Refuge boundaries, and maintains an extensive palm tree collection of over 100 species. He is one who truly enjoys the environment he works so hard to protect. Although most people might be driven to the brink of insanity by the extreme numbers of salt marsh mosquitoes in the Refuge, Steve doesn't seem to be phased by them at all. He says that the mosquitoes "*keep him company*" at times. The authors experience with Steve has been a true blessing. He is a well-balanced guy who has a healthy perspective on wildlife management. No one

loves this habitat more than he does or has sacrificed more personally for the advance of the cause of protecting the endangered species on his Refuge. This is evident through what has been accomplished through his service to the Refuge. Even though Steve Klett is a "one man show," his dedication has provided a haven for hundreds of species of the Lepidoptera Order that we have grown to love, respect, and desire to know more about. He has been a perfect gentleman, a helpful overseer and a good friend.

To Steve Klett, for how diligently you have loved and served South Florida's natural resources, Howard and I (David) wish to say: "THANK YOU!!!!"



Fig. 28. Calidota laqueata



Fig. 29. Aellopos tantalus

CONCLUSION

Our hope is that through this article, the reader can attain a glimpse of the richness that is within the boundaries of Crocodile Lake National Wildlife Refuge, in its history as well as in its flora and fauna. With over 300 species of tropical and subtropical moths collected (about 1/2 of which have been positively identified), the Refuge has proven to be a very healthy ecosystem providing a very exciting collecting experience. Seven years after officially beginning this project, the authors are still finding species that we have not yet taken. There are also other very elusive species, such as Calidota laqueata (Fig. 28) which had been largely absent except for one male specimen taken in May of 2008 which then showed up in fair numbers in 2010. Eumorpha vitis and a few other species are represented by sole specimens. There have also been exciting day-time moth-collecting experiences. Each winter, the Chromolaena odorata goes into bloom. This flower attracts a great number of butterfly species which have been noted, for instance, (Heraclides cresphontes, Glutophrissa drusilla, Ascia monuste, Phoebis sennae, Phoebis agarithe, Leptotes cassius, Hemiargus ceraunus, Chlorostrymon simaethis, Electrostrymon angelia, Strymon melinus, Strymon istapa, Strymon martialis, Calycopis cecrops, Agraulis vanillae, Heliconius charithonia, Dryas iulia, Phocides pigmalion, Polygonus leo, Urbanus dorantes, Urbanus proteus, Asbolis capucinus, Cymaenes tripunctus, Lerodea eufala, Atalopedes campestris, Hylephila phyleus, Oligoria

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maculata, Panoquina panoquin, Wallengrenia otho and Polites vibex)⁽¹⁷⁾. These feathery blue flowers are a great attractant for a plethora of flies, bees and wasps, but also a number of crepuscular Sphinx moths we have come across – Eupyrrhoglossum sagra, Aellopos tantalus (Fig. 29, previous page) and Cautethia grotei (Figs. 30 and 31) – as well as other beauties such as Composia fidelissima, Eupseudosoma involutum and Syntomeida epilais. It is truly amazing to see a plant like this bring bugs "out of the woodworks!"



Fig. 30. Cautethia grotei at Chromolaena odorata bloom

Fig. 31. Cautethia grotei at Chromolaena odorata flower

The plan is to continue the project until new species are no longer seen coming into the lights. By the end of the survey, it is believed that the vast majority of the moth species that exist in the Florida Keys will have been collected. Host plants and life cycles of moths encountered including egg, larvae and pupae are also

being recorded photographically whenever possible. While this phase of the project is certainly nowhere near complete, immature stage photographs and information will certainly be a tremendous addition for future publications. One significant facet of having access to Crocodile Lake National Wildlife Refuge is that it encompasses two of the three major habitats that make up the Keys' diversity. With large salt-marsh and mangrove areas as well as plenty of hardwood hammocks with variable vegetation, it is likely that a large percentage of the moth species of the Florida Keys will be represented in this survey. The only major habitat not represented in the Refuge would be the Slash Pines of the lower Keys. As time goes on, Howard and I look forward to completing, to the best of our ability:

- 1) A comprehensive list and photographic plate-representation of the moths of the Florida Keys;
- 2) An evaluation of the range of various species throughout Monroe County;
- 3) An evaluation of moth species that may be threatened or imperiled;
- 4) An ongoing documentation of immature stages and host plants of moths of the Keys.

Please pardon the quasi-scientific style present throughout this article. We cannot help but write these pages with emotion as we reminisce through the wonderful times spent in the Refuge doing our work as well as the fellowship enjoyed at Gus's Grill and the Buzzard's Roost (heck, we even hit Waffle House a couple of times in Leroy's honor!) over breakfast and sea food buffets discussing the days' findings. The emotions that arise while trekking through the beautiful hardwood hammocks with the breathtaking panoramic background of the Gulf of Mexico are the reason that we all do this thing called science. We are all stimulated in some way as we peruse our scientific goals. While doing so, it has been an absolute joy to take in the history of this Refuge, the phenomenal natural spectacles that it presently contains, as well as to be able to dream of what future exploration will uncover, all while admiring God's amazing handiwork each time we get to look at a different moth species!



Chlorostrymon simaethis

Composia fidelissima mating

Phryxus caicus

ACKNOWLEDGEMENTS

Howard and David want to express their deep felt gratitude to all of the people who have made publication of this article possible. To Steve Klett for creating an awesome atmosphere of learning, access, and hospitality - for allowing David and Howard to use the facilities of storage for our equipment for the project as well as a place to stay (the research trailer) while spending nights collecting in the Refuge as well as for the access to the collection of articles that have been accumulated over the years that contributed to the historical information contained in these pages, but most importantly, thanks for your friendship! Thanks to our wives, Noemi and Sheila, for supporting us as we have been in pursuit of our dreams and ambitions. Thanks to David's kids, Sofia and Lorenzo, for lending dad to the project from time to time. Thanks to Jose Manuel Pyco and Eddie Carvalho for producing the graphs and maps in the article. Thanks to Linda Helm for helping with proof reading. Thanks to Charles Howard Grisham Jr. for the photography and formatting of the plates and a Special thanks to our Heavenly Father for creating all of these creatures that we love and admire so much!



Eumorpha vitis

Eunica tatila

Eunica tatila

Literature

- 1) Brown, Harlen, "Remembering the Cock Fights" The Free Press 28 April 2006.
- 2) Covell, Jr. C., 1984. A Field Guide to Moths of Eastern North America. Houghton Mifflin Co: Boston, MA.
- 3) Duffy, Brian, "Case of the 'Phantom City" The Miami Herald 25 July 1982.
- Duffy, Brian, "State Files suit to halt Port Bougainville" <u>The Miami Herald</u> 3 August 1982.
 Duffy, Brian, "Developers vow to cut roads, increase lakes" <u>The Miami Herald</u> 7 August 1982.
- 6) Duffy, Brian, and Hiaasen, Carl, "Builders to alter natures plan in North Key Largo" The Miami Herald 25 July 1982.
- 7) Duffy, Brian, and Hiaasen, Carl, "Mystery of a pipeline that no one wanted" The Miami Herald 27 July 1982.
- 8) Fine, D., 2006. Spring Leps in Florida. Southern Lepidopterists' Society News 28(2):36-47;68.
- 9) Fine, D., 2007. A Friendly Response to 'Letter to the Editor'. Southern Lepidopterists' Society News 29(3):81-88, 105-107,117.
- 10) Hiaasen, Carl, "The scars of past developments dot Keys" The Miami Herald 27 July 1982.
- Hiaasen, Carl, "Work halted on Keys project; site plans to get a full airing" <u>The Miami Herald</u> 4 August 1982.
 Hiaasen, Carl, and Duffy, Brian, "State never saw plans for giant project" <u>The Miami Herald</u> 26 July 1982.
 Hiaasen, Carl, and Duffy, Brian, "Firm works for both County, developers" <u>The Miami Herald</u> 26 July 1982.

- 14) Hribar, L.J., 2007. Letter to the Editor. Southern Lepidopterists' Society News 29(2):42-43.
- 15) Kimball, C. P., 1965. Arthropods of Florida and Neighboring Land Areas, Volume 1; Lepidoptera of Florida. Division of Plant Industry, State of Florida Department of Agriculture, Gainesville, FL.
- 16) Lynch, Marika, "Wildlife Refuge gets its first 'Lawman'" The Miami Herald 21 September 1997.
- 17) Minno, M.C. & Emmel T.C., 1993. Butterflies of the Florida Keys. Scientific Publishers: Gainesville, FL.
- 18) Mosely, Ali & Family, "Letter to the Editor" Editorial Ocean Reef Press 28 April 2006.
- 19) Peterson, Edward and Carter, Charles, D., 1st Sergeant "Top" Peterson, Edward U.S. Army, Retired, and Staff Sergeant Carter, Charles D., Military Historian "The History of the Nike Hercules Missile Site in Key Largo, Florida" Key Largo Public Library Program Agenda 13 Jan. 2003.
- 20) Silk, Robert, "Disney to help save endangered woodrat," http://Keysnews.com, <www.//keysnews.com/28359417345 2579. bsp.htm 5 July 2005 > 24 September 2010.
- 21) Swoyer, Scott, "Crocodile Lake Refuge Manager busy settling in office 'home'" The Islamorada Free Press 10 September 1997.
- 22) Tuttle, J.P., 2007. The Hawk Moths of North America, The Wedge Etomological Research Foundation, Washington, DC.
- 23) Wilkinson, Jerry, "History of Key Largo" http://www.keyshistory.org/keylargo.html < 24 September 2010.
- 24) Wilkinson, Jerry, "History of North Key Largo" http://keyshistory.org/nokeylargo.html < 24 September 2010.
- 25) Wilkinson, Jerry, "History of the North Key Largo Missile Site" http://keyshistory.org/KL-NikeSite.html <24 September 2010.
- 26) Young, David, "Trailers cleaned out of wildlife refuge, donated" The Reporter, Local News 2 September 1999.



Oxydia vesulia

Syntomeida epilais

Lymire edwardsii



Pseudosphinx tetrio



Xanthopastis timais



Synchlora cupedinaria



Cocytius antaeus



Madoryx pseudothyreus



Tortyra slossonia



Spiders taking advantage of Chromolaena odorata bloom

Halysidota tessellaris

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Phocides pigmalion

Phaedropsis stictigramma

Synchlora frondaria

MOTHS OF CROCODILE LAKE NATIONAL WILDLIFE REFUGE COLOR PLATES, PHASE I, JULY 18, 2011

The color plates which follow depict moths taken either by David Fine or Howard Grisham at Crocodile Lake National Wildlife Refuge during our moth survey there. The reader will note that the majority of the moths were collected at the Nike Missile Site area on the Refuge and, indeed, the majority of our collecting efforts have been directed towards that area, for several reasons. First, and primarily, this site contains significant relatively open spaces, facilitating a favorable intake of specimens flying in to our light traps and MV light sheets. Of equal importance, collecting at the Nike Site affords a researcher privacy, since one can drive off the main highway traversing through the Refuge, and lock the gate behind him. My tolerant wife, Sheila, learned the hard way of the likely complications of parking on the main road and setting out light traps from there, as the last time we tried this option together, having left her sitting in our vehicle while setting out traps at the Cock Fighting Arena Site, upon return, I walked into no less than four U. S. Immigration Officers, with pistols in hand, who seemed convinced that I had kidnapped her or otherwise had inappropriate designs in mind. I certainly could see their point as, who the hell in their right mind would go into a hammock heavily infested with mosquitoes, for the purpose of catching bugs? Anyway, after showing some ID, working up some verbal camaraderie, and respectfully pointing out that our Alabama redneck accents and the fact of my wife's vellow hair served to minimize the likelihood that I was smuggling in illegal Haitians or Cubans, we all had a good laugh, all of us except Sheila, who remained somewhat traumatized and vowed never to go with me on collecting ventures on the Refuge again, a promise she faithfully has kept in most vociferous fashion!

I wish to thank those of my friends, especially Cliff Ferris and James Adams, who assisted in the identifications of some of the specimens depicted. I am confident that the io and imperial moths are correctly named, as well as most (and hopefully all) of the moths. If there are any incorrectly determined specimens, however, the fault is entirely mine, and it would be greatly appreciated if any mistakes are pointed out to me (chgrisham@comcast.net).

Also, I wish to thank my son, Charles, for his assistance and patience in photographing the specimens depicted herein.

Lastly, it is to be emphasized that the following photographs reflect the moth species taken in the survey which have been identified so far. There are well over one hundred species in hand not yet identified, which will be the subject of a subsequent plate publication down the road. David and I are in the process of submitting a proposal to the United States Fish and Wildlife Service to add the Key Deer National Wildlife Refuge as a permitted moth survey area, it being our intention, at the end of the day, to assimilate a modern comprehensive (and self-funded) publication as to the moth fauna in the entire area of the Florida Keys.

C. Howard Grisham July 18, 2011







gloverii FL: Monroe Co. Key Largo Crocodile Lake NWR, Cockfighting Arena Site October 16, 2007, light trap



998 Ethmia farrella FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site May 23-24, 2008 Coll: H. Grisham light trap



















4647 Male Megalopyge opercularis Chercularis FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site Dec 8-11, 2009 Coll: H. Grisham







4673 Male Alarodia slossoniae (no dots) FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site August 26-27, 2008 Coll: H. Grisham light trap





4697 Female Euclea delphinii FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site December 8-11, 2009 Coll: H. Grisham light trap







Dichogama redtenbacheri FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site December 8-11, 2009 Coll: H. Grisham light













5069 Pyrausta tyralis EL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site August 26-27, 2008 Coll: H, Grisham light trap Det: 12/08 Cliff Ferris



5123 Deuterophysa fernaldi FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site December 27-29, 2008 light



THE DIACTIE TOPSALS FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site December 8-11, 2009 Coll: H. Grisham light trap









5159 Desmia maculalis FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site area May 16-19, 2010 Coll: H. Grisham light trap





5169 Hymenia perspectalis FL: Morroe Co. Key Largo Crocodile Lake NWR Nike Missile Site December 8-11, 2009 Coll: H. Grisham light tran



5170 Spoladea recurvalis FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site July 28-29, 2009 Coll: H. Grisham light trap



5177 Apogeshna FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site August 28-29, 2008 Coll: H. Grisham light trap





5204 Diaphania hyalinata FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site August 28-29, 2008 Coll: H. Grisham light trap













5251.1 Lygropia fusalis FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site area June 23-July 2, 2010 Coll: H. Grisham light trap



⁵²⁷⁴ Herpetogramma phaeopteralis FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site August 26-27, 2008 Coll: H. Grisham light trap













5579 Macalla 20/19 MaCalla zelleri FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site April 21-24, 2009 Coll: H. Grisham light trap trap



IEUCOGIAMMA FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site April 21-24, 2009 Coll: H. Grisham light trap









.







Stylopalpia Styropaipia Iunigerella FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site August 26-27, 2008 Coll: H. Grisham light



























6800 Female Sphacelodes vulneraria VUINCETATIA FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site area August 28-29, 2008 Coll: H. Grisham light





















7059 Synchlora f. frondaria FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site April 21-24, 2009 Coll: H. Grisham light trap





7061 Synchlora herbaria FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site April 21-24, 2009 Coll: H. Grisham light trap









7137 Cyclophora FL: Monroe Co. Key Largo Crocodile Lake Cockfighting Arena Site October 17, 2007 light trap













































7832 Erinnyis FL: Monroe Co. Key Largo Crocodile Lake NWR June, 2004















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1















8431 Schrankia FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site April 21-24, 2009 Coll: H. Grisham (light trap)



Hemeroplanis scopulepes SCODUREDES FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site are December 27-29, 2008 Coll: H. Grisham (light trap)

































































8890 Chrysodeixis (Pseudoplusia) includens FL: Monroe Co. Key Largo Crocodile Lake NWR June, 2004











Ozarba nebula Uzarba nebula FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site April 21-24, 2009 Coll: H. Grisham





9077 Eumestleta cinnamomea Chimannon Co. Key Largo Crocodile Lake NWR Nike Missile Site December 27-29, 2008 Coll: H. Grisham (light trap)













9308.1 Euscirrhopterus Docyi FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site May 23-24, 2008





9085

Tarachidia

semiflava

Semiflava FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site May 23-24, 2004 Coll: H. Grisham (light trap)



Spragueia Gama FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site July 28-29, 2009 Coll: H. Grisham (light trap)

















⁹⁶⁷² Spodoptera eridania FL: Monroe Co. Key Largo Crocodile Lake NWR June, 2004















Catabenoides FL: Monroe Co. Key Largo Crocodile Lake NWR Nike Missile Site May 23-24, 2008 Coll: H. Grisham





















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