Uncovering life history traits and conservation strategies for the Golden Swallow, *Tachycineta euchrysea sclateri*, a threatened and endemic passerine on the island of Hispaniola

2013 FIELD SEASON REPORT

***Builds upon 2012 Field Season Report available at www.thegoldenswallow.org**

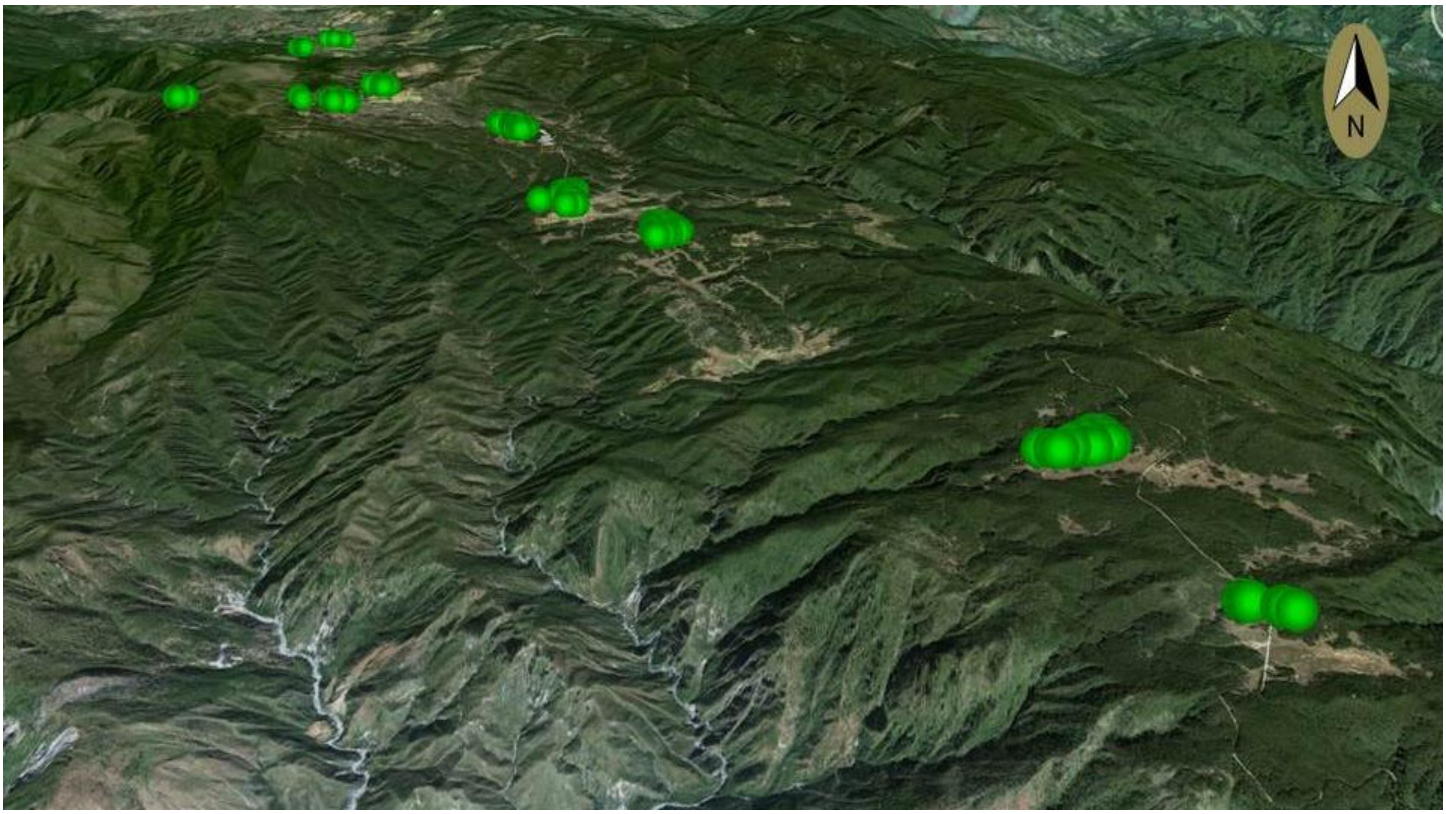
C. Justin Proctor
The Golden Swallow Project
MS Student; Department of Natural Resources; Cornell University
NSF Graduate Research Fellow
Address: 260 Sapsucker Woods Road, Ithaca, New York 14850 USA
Cell: 607-229-6255

ABSTRACT

The Golden Swallow Project saw its second successful year in the Dominican Republic in 2013. Returning with a better understanding of the Golden swallows allowed us to refine our methodologies and interact at a much more intimate level with the species while reducing levels of disturbance.

The first of two separate trips took place from February 5th to the 18th when I was joined by a fellow 'golondrinista' from the United States, Timothy Salzman, in an effort to relocate and amplify our network of nest-boxes in Parque Valle Nuevo. Responding to the high levels of depredation suffered by nesting swallows in the tree-mounted boxes in 2012, we relocated the nest-boxes to free standing poles with predator guards. We simultaneously built 100 additional nest-boxes that were either added to previous nesting sites where boxes were limited or established in new locations where swallows had been seen foraging the previous year.

The full-length field season, an effort to continue filling in the missing gaps of the Golden Swallow's life history, began on April 20th and ran for a duration of three months. With the help of the project's first two interns, we were able to gain a much better understanding of the species' behavior, survival, movements, and reproductive strategies. Equally important, our outreach capacity has grown quickly with the forming of new collaborations within the Dominican Republic, leading to increased awareness and local support for the conservation of the Golden Swallows. We hope to publish a series of scientific papers this winter. Future field season objectives include developing a comprehensive distribution map of the species throughout Hispaniola and further developing a nest-box network that spans the altitudinal gradient occupied by the species for future comparative studies.



Google Earth view showing aggregations of nest-boxes (160 boxes in total) spread across Parque Valle Nuevo.

RESEARCH TEAM

Our field crew this year was led by:

Justin Proctor
Cornell University

&

Marisol Mata
San Miguel de Tucuman

One of the main goals of the Golden Swallow Project is to build local capacity through training Dominican students into well-developed field biologists while continuing to provide them opportunities for continued advancement in an ecology and/or ornithology –related career path. During the 2013 field season, we were able to employ and train two interns:

Hodali Almonthe is a recently-graduated biology student from Santo Domingo that has had considerable experience working with birding projects throughout the Dominican Republic, including the Vermont Center of Ecostudies' efforts in studying the overwintering habits of the Bicknell's Thrush. Hodali is currently employed by the Museo de Historia Natural in Santo Domingo where she enjoys working extensively with the museum's collections.

Lucie Guirkinger is currently studying Zoology at the Royal Holloway University in London, England, but resides in the Dominican Republic when not in school. Lucie has a passion for working with animals in the outdoors and has spent considerable time working a diverse array of internships to gain field experience and a better understanding of the subject matter that she'd be interested in pursuing as a career.

FIELD SEASON OVERVIEW and METHODOLOGY

As in 2012, our field team arrived at our primary study site in Parque Valle Nuevo late in the nest building stage of the breeding season. Now armed with a much better understanding of the species' responses to varying magnitudes of disturbance across the nesting season , we were able to maximize data collection while minimizing total number of visits to each active nest box. Therefore, nest-box checks occurred at specific time intervals depending on their status. Timing and methodology of visits were adopted from the Golondrinas de Las Americas Project Handbook (GLA Handbook) but modified to best interact with this *Tachycineta* species.

Nesting Stage	Frequency	Value
Nest building	Every 2nd day	Construction rate and methodology, timing of first egg
Egg laying	Every 2nd day	Clutch size and onset of incubation
Incubation	16th day from onset -> hatch	Length of incubation, hatching date
Chicks	Day 0, 3, 6, 9, 12, 24 -> fledge	Hatching date, growth measurements, fledging date

Nesting attempts were established upon the laying of the first egg. Golden Swallows lay one egg daily until clutch completion. Though our methodology delineates clutch completion to equal the first day of incubation, it was frequently noted that eggs laid earlier on were warm to the touch prior to the last egg being laid. This hints at the possibility of an earlier onset of incubation with earlier laid eggs in many clutches. Conversely, in some cases eggs were not warm to the touch on the day of clutch completion. Therefore our estimation parameters for total incubation length may not necessarily reflect the true length of time an adult female was actively incubating the clutch. Despite these discrepancies, in all observed cases the entirety of the clutch hatched within a 24 hour time period.

Adult females were captured using a wig-wag method designed to trap them inside of the box during a feeding bout. The captures took place when nestlings were between 2 and 4 days of age (hatch day = 0). Adult females were painted with an indelible marker on the rump and chest so as to denote their sex in flight, ultimately allowing two observers to differentiate and trap the males within the nest box during a subsequent feeding bout. Both male and female adults were banded and measured for morphometric data upon their capture. We specifically measured (1) **head-bill** as being the maximum distance between the back of the head and the bill tip using dial calipers, (2) **flattened wing length** taken from the bend of the wing to the tip of the longest primary feather (9th) using a ruler with a wing stop, (3) **bill length** along the culmen from the tip of the bill to the anterior edge of the nostrils using dial calipers, (4) **tail length** taken from the base of the tail to the tip of the longest feathers using a ruler, and (5) **body mass** using an electronic scale. Sex was established based upon the presence of a cloacal protuberance in males and a brood patch in females.

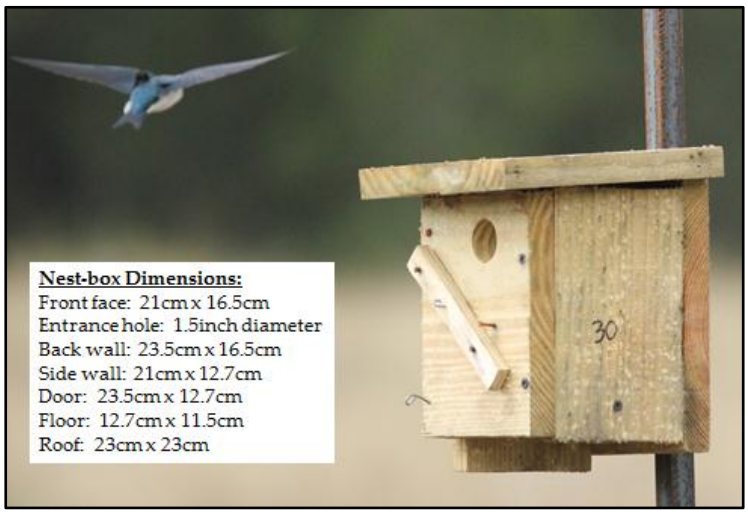
Chicks were measured for **head-bill**, **flattened wing length**, and **body mass** (as according to methods described above) on days 3, 6, 9, and 12. All chicks were banded on day 12. All bands used are uniquely coded and come from National Band and Tag, size 1242F0.

Observational work (incubation and feeding bouts, mating and interaction behavior) was routinely conducted with field binoculars from an average distance of 25 meters that varied depending on geographical constraints and the presence of natural blinds provided by vegetation.

THE NEST-BOXES

Our artificial nest-boxes and their design, placement, and abundance are without a doubt the most important aspect of the project and its long-term success in both studying and protecting the Golden Swallows. The nest-boxes allow us to intimately study the reproductive life history of the species while further monitoring changes in demographics and survival in the population over time.

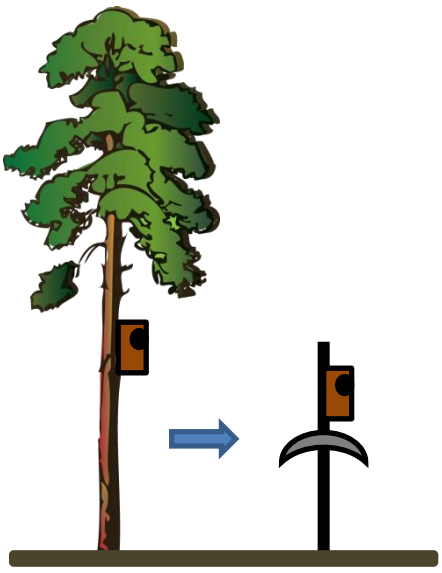
The artificial nest-boxes being used in Parque Valle Nuevo and the Acetillar Region of the Dominican Republic are a modified derivative of those designed and used extensively throughout the Golondrinas de Las Americas network (http://golondrinas.cornell.edu). Great care has been taken to maintain consistency in design across all sites as well as to address the limitations of a nest-box approach to studying wild populations (Lambrechts et al, 2010). We acknowledge that the nest-boxes themselves may have an influence on clutch size, reproductive success, survival, as well as overall breeding distribution (Robertson, 1989). We recognize that changes in life history behavior as a result of the nest-boxes are of particular concern to an already vulnerable species.



In the case of the Golden Swallows, these problems could be viewed as potential conservation opportunities. A functioning program of available nest-boxes that can protect breeding pairs and their offspring from depredation could help local populations rebound. Furthermore, changes in nest-box design that increase average clutch sizes could additionally support increases in local abundance. Future, carefully planned scientific studies should explore these hypotheses further.

NEST BOX RELOCATION and RESPONSE

We decided to take a leap of faith this year and relocate all of the existing nest-boxes (that had been originally mounted on tree trunks) to metal posts. This decision was made after losing 40% of the local breeding population in 2012 to depredation by invasive rats (species thought to be *Rattus norvegicus*) – an extremely high mortality rate that could have partially been an artifact of the dense clustering of our artificial nest-boxes. The severity as to the impact of invasive rats on native bird populations throughout the Caribbean is alarming, and has been in part attributed to the likely extirpation of the *Tachycineta euchrysea euchrysea* subspecies of Golden Swallow historically found on the island of Jamaica (Graves, 2013).



Changing the location, orientation, and heights of those nest-boxes poses the possibility that swallows returning to the reproductive grounds may be deterred from using the artificial cavities that they no

longer recognize or associate with. Seeing as we could not protect nest-boxes mounted to trees, our only reliable option was to use a metal pole and predator guard setup that has worked across the Americas with other congeners.

In most cases, boxes were removed from the tree and relocated on a metal post directly in front of the tree, being careful to maintain the original orientation as it has been showed to have an effect on nest preference, microclimate, and fitness of the breeding pair (Ardia et al., 2006). The relocation did require a lateral movement of 5 to 10 feet out from the base of the tree depending on ground conditions. It was, however, impossible to maintain the original height of the box (on average between 7 to 10 feet high), and thus all boxes were mounted between 5 and 6 feet high. Due to limited resources, we waited to mount predator guards below the boxes until boxes were deemed active by the construction of a nest.

The most remarkable outcome of relocating the boxes from tree trunks to metal posts was the change in behavior exhibited by a large majority of the swallows. When the boxes were mounted to trees during the 2012 breeding season, not a single individual was observed perched on or near a nest-box. Once the nest-boxes were mounted to the poles (coinciding with an increase in distance from the forest edge), many swallows were observed preening, singing, and resting on the nest-boxes – three behaviors we associate with less stressful environments. We hypothesize that the change in behavior is a result of an increase in the swallow's view of the surrounding landscape, and thus its ability to scan for and react to threatening stimuli.

Some boxes attached to tree trunks were not able to be re-mounted onto poles until later into the breeding season. This resulted in the need to move these boxes while they were active. The following table summarizes the 18 nest-boxes relocated while active at varying stages in the breeding cycle.

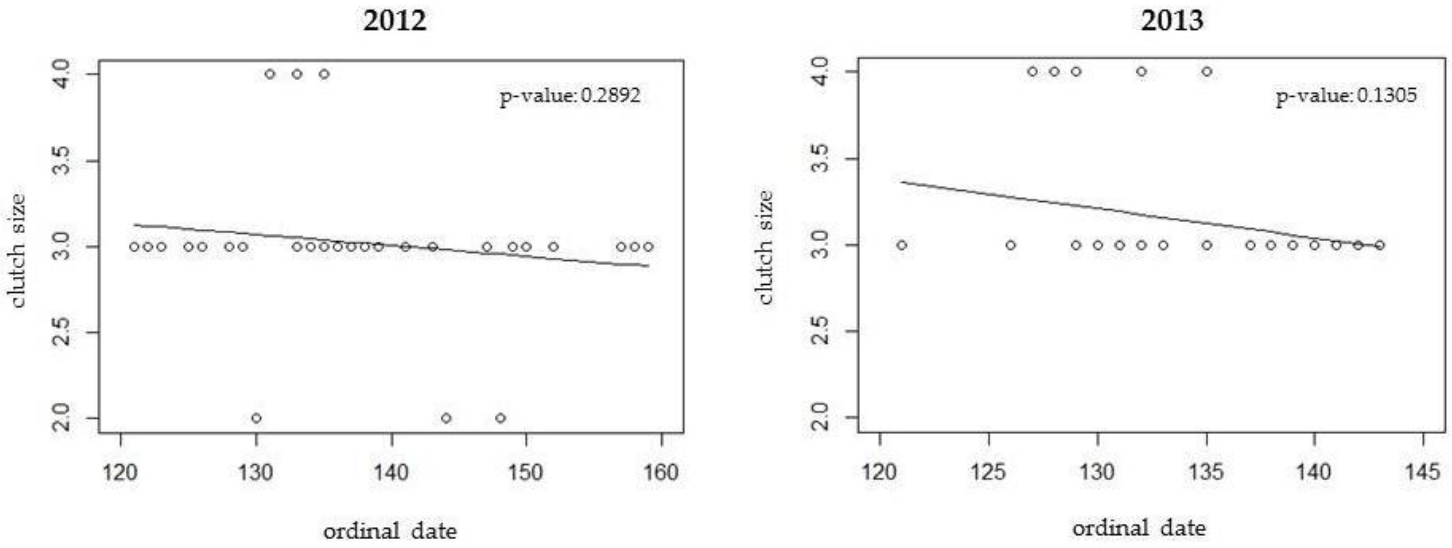
Stage of Reproduction	Number of Boxes	Result
Nest building	15	14 pairs resumed nest building, 1 pair relocated to nearby box
Laying	1	Resumed laying
Early incubation	1	Resumed incubation
Late incubation	1	Resumed incubation

It is important to note that neither the female nor male was caught prior to this experiment and thus we cannot say for certain that the same pair remained with the same box after it was moved; however, when nests were immediately active again the next day we are making the assumption that the same pair stayed with the box as opposed to an extremely rapid colonization by another distinct pair. The 94% success rate speaks strongly of this population of Golden Swallow's tolerance to this level of disturbance. We would expect to see higher abandonment when the disturbance occurred earlier in the nesting cycle (e.g. nest building, egg laying), as personal observations stemming from my work with this species as well as several congeners in the past has supported the underlying theory behind the Concorde Fallacy (Winkler, 1991), in that toleration to disturbance would increase the farther along the nesting season progressed as a result of accumulated investment over time. Though the sample size is extremely low beyond the nest building stage, it is worth acknowledging that the three manipulated nesting pairs continued to lay and incubate new eggs, despite the low amount of investment to the brood at that point.

SYNCHRONY, FIDELITY, and DISPERSAL

Though a third and fourth field season will be invaluable in terms of looking for stronger trends and patterns in survival, site fidelity, recruitment, and dispersal, we are already able to make some interesting observations.

The following linear regressions begin to show us the relationships between lay date and clutch size, as well as the timing and length of the breeding season for Golden Swallows in Parque Valle Nuevo.



Though not statistically significant, trends show that there is a decrease in clutch size as the calendar year progresses. In 2013, we see patterns for larger clutch sizes, as well as fewer clutches initiated later on in the season.

An After-Second-Year (ASY) female that we banded last year (as an adult) returned this year to the same box at the same sight, built a nest and laid her first egg on the same ordinal date as she did the year prior (in 2012, February had 29 days and the first egg arrived on April 30th, this year February had 28 days and the first egg arrived on May 1st). Furthermore, she was paired with the same male.

Year	First Egg	Ordinal Date	Swallow ID	Location
2012	April 30th	121	Male 5511; Female 5501	Nizaito Box 6
2013	May 1st	121	Male 5511; Female 5501	Nizaito Box 6

Out of the 23 females recaptured this year, 22 of those remained loyal to the same field site (we currently have 10 field sites, each of which is a conglomeration of nest boxes at least 2km from other groupings of nest boxes). Of those 22, 11 females remained loyal to the same box (despite many of those boxes being repositioned as discussed in the previous section of this report). After much greater success trapping and banding adult males this year, we have just begun to collect data on inter-annual male life history.

In 2012, 97 chicks were banded. This year, we recaptured 24 adults in total (23 female, 1 male). Only one of those 24 adults was a Second-Year (SY) bird banded by us as a chick, which happened to be a female. A myriad of questions arise when we try to make sense of these numbers. Why are adults returning but not chicks? Are chicks dispersing, or are they simply not surviving through the winter? Where are they going, or what is killing them, respectively? Because of the amounts of data needed and the difficulties researchers confront in order to acquire those data, dispersal, according to Clobert et al., 2001 and Wink et al., 2005, is

probably the most important yet least understood life history trait. The leverage that could be gained by answers to some of these questions would be monumental in developing a comprehensive conservation plan for the Golden Swallows, and driven by that goal, we are going to focus more on the species' abundance and distribution in field seasons to come.

FLEXIBILITY / ADAPTABILITY

Different species respond to today's sometimes rapidly changing world in unique ways. Surrounded by anthropogenic encroachment, climate change, and invasive predators, what options do Golden Swallows have and to what capacity can they adapt to them? In the hope of beginning to gain a better understanding of how Golden Swallows are responding, we want to pay particular attention to their current limitations and adaptability for breeding success.

In order to address this question, we are particularly interested in *where* the species is able to successfully nest. Within Parque Valle Nuevo, we have observed a diverse array of 'natural' nest locations beyond our artificial nest-boxes that in many cases appear to be opportunistic, depending entirely on what is available. Nests have been found in both natural occurring holes and those excavated by Hispaniolan Woodpeckers in the trunks of dead snags (Bond, 1943), on wooden shelves above windows in vacant buildings, and in the concrete crevices of old walls. This year we recorded the first instance of GOSW nesting in an open cup of dead lichen on a pine tree branch in Valle Nuevo (see accompanying photograph). Meanwhile, Golden Swallows in the southwest of the country are nesting in high frequency within rock crevices scattered across the walls of abandoned bauxite mines and limestone cliffs (Fernandez & Keith, 2003; Townsend, 2008).

Natural nests have been found to span an altitudinal gradient from 1,390m (4,560ft) in the Acetillar region of the Sierra de Bahoruco to 2,632m (8,635ft) in Parque Valle Nuevo. We have observed across all nesting sites consistency in the presence of mixed pine forest and grassy meadows accompanied by a nearby water source (varying from flowing stream to stagnant pools to habitually wet depressions in the landscape). It's important to note that we have rarely noticed Golden Swallows entering forest, as they are typically seen foraging over open grasslands and fields of low shrubs and thicket. Fluctuations in yearly rainfall could play a large role in year-to-year insect abundance on both wide and local scales, leading us to think that the presence or absence of an available water source could be a powerful predictor of annual reproductive success.

Though nests have been found in abandoned buildings, it was unclear as to the species' tolerance towards nesting in and around *active* human establishments. With increases in anthropogenic spread and pressures both surrounding and inside the national park, the future of this species could largely depend on their ability to exist in close proximity to people.

In mid-June of 2013, I received information from our friend, Kako, one of the local park guards that have taken a strong interest in our project, that a nest-box located adjacent to his mountain-top *caseta* in a region of the

park called Pajon Blanco had become active. The exact history of this box was unknown to us, but we had been told that several years back the park guards had found one of the original tree-mounted boxes on the ground and decided to mount it onto a tree trunk located approximately 15 meters from their guard house. We had noticed the box in 2012 and had little expectation that it would ever be occupied. It was, as many of the tree-mounted boxes were, overrun with a sizeable local katydid (*Polyancistrus loripes*, described by Rehn, 1935) and was empty of any nesting materials – evidence that the box had never been used by any pair of swallows before we arrived. Moreover, the box was a stone-throw away from a house occupied year-round by two park guards, a roaming mule, chickens, and two dogs. Upon opening the nest-box to validate Kako's findings, we found an incubating female inside accompanied by a well-constructed nest and three warm eggs. Not only was this the first active nest-box we've seen in such close proximity to active human establishments, this box was located at 2,638 meters above sea level, nearly 200 meters higher than our previously highest nesting pair. To make this find even more impressive, there were six katydids crawling over the female as she lay motionless incubating her clutch.

In 2012, we did occasionally note that one katydid would live inside a nest-box with an active pair of nesting swallows, though often hiding itself underneath the nesting material. We cannot think of any symbiotic relationship that may exist between the swallows and katydid, but rather that they are simply capable of sharing a cavity together. A possible form of mutualism has been hypothesized in that the katydids may sound a warning call when danger is approaching, thus allowing the swallows to flee the box and take flight before being trapped and attacked. However, after examining the large number of nests depredated by rats in 2012, it was clear that both the swallow and katydid were depredated together. Seeing as GOSW nests are nearly devoid of fecal matter, it is difficult to attribute katydid presence to their use of the excrement and thus benefiting from the presence of the swallows. Lastly, large numbers of katydids were often found congregating in boxes where swallows have never before nested.

It turned out that this nest was successful in fledging three GOSW chicks, ultimately establishing new parameters with respect to nesting plasticity for the species.

CAVITY LIMITATION in VALLE NUEVO

It has been suggested that the attractiveness of artificial nest-boxes to breeding GOSW is significantly higher in Parque Valle Nuevo compared to other breeding sites due to the limitation of naturally occurring cavities. Until more thorough survey work and natural cavity searching are completed, this is a challenging hypothesis to test and evaluate. That being said, anecdotal evidence is supportive.

We opportunistically chose three new locations to erect nest-boxes in 2013 where we had the year prior seen foraging GOSW. Some boxes we erected early on in the summer, when nearby GOSW were just beginning to lay eggs, while others were erected in late summer, when most GOSW chicks were approaching fledge day. No matter the timing, at least one pair of GOSW began occupying a new nest-box within one week's time. Most impressive was the scene that took place in an old agricultural region of the park, named Nizaito, where a pine tree reforestation project commenced the year prior. While erecting a network of seven nest-boxes, two GOSW pairs were flying behind us, entering and investigating each nest-box within one minute of its assembly. Within five days, the two pairs had established active nests within these boxes. As discussed in the

2012 Field Season Report, a low abundance of available natural cavities could be a combined result of a several factors, including a forest dominated by immature pines stemming from historical logging and reoccurring natural fires, as well as the scarcity of Hispaniolan woodpeckers.

These findings reinforce the importance of the artificial nest-boxes in this region of the Dominican Republic, but moreso the need to better understand how natural cavity availability has changed over time and how a long-term conservation plan could best address habitat management in such a way as to promote an increase in natural cavity availability.

PATTERNS in PLUMAGE

Our study has resulted in close, repeated interaction with Golden Swallow chicks, fledglings, and adults in the hand. This provides a unique opportunity to study differences and patterns in plumage between sexes and across age – information that can be valuable for sexing and aging Golden Swallows in flight.

Photographs were taken opportunistically of adults (upon capture) and chicks (just previous to fledging) throughout the breeding season. Our goal is to look for any apparent patterns in plumage that could be used to sex and age a non-breeding bird in the hand and/or in flight by future observers.

a) AHY Male

b) AHY Female

c) Day 24 Chick

Agreeable to information found in the most current birding guide for the island, *Birds of the Dominican Republic and Haiti* (Latta et al, 2006), we found that the presence or absence of darker mottling on the chest as well as on the lateral/dorsal portions of the white collar are clear identifiers for sexing the birds. Both AHY (n=17) and ASY (n=1) males having chests and collar regions completely 'clean' of mottling, while all AHY (n=14), ASY (n=16), and SY (n=1) females showed some various degree of mottling in both regions. There do not appear to be any obvious patterns at this point in the magnitude, location, or color intensity of mottling in females across years. Male ventral coloring can be described as a much more 'crisp' white than that compared to females. Near to fledging chicks possess either a complete or partially complete 'necklace' of darker streaks that is always strongly evident near the shoulder but less frequently connects as it approaches the center of the chest (photo (c) above shows the most dark and complete necklace observed in an older chick).

With our banding program entering its third breeding season, we should be able to paint a much more comprehensive picture in 2014 of how plumage characteristics change as a function of age.

PARENTAL PROVISIONING and DIET

More advanced trapping techniques, a better knowledge of the study species, and a larger field crew has allowed us to remove adults much faster from the nest-box after initial capture. Many adults extracted from the box were found to still be clutching insects ultimately meant for the chicks. We carefully removed the insects and placed these samples into a vial filled with 70% isopropyl. As can be seen from the photos below, the majority of the insects were still alive and functional. These captures have confirmed that males do help the female provision chicks, though our observations are limited to the first four days after hatching. Future work will determine if this pattern holds true until fledgling.

Samples have been sent to Ruth Bastardo and her entomology lab at the Universidad Autonoma de Santo Doming (UASD) where the insects will be counted and identified. We hope to grow this collaboration into a thesis for a Dominican student within the entomology lab that would be interested in studying the feeding behavior of Golden Swallows at a much more detailed level. Comparing bolus samples against total insect diversity and abundance over a temporal scale in areas where swallows are feeding can help us better understand whether this species is a generalist or specialist aerial insectivore. Food loads can also be compared with weather and chick growth, painting a much more complete picture of how food ties into reproductive success across years.

THREATS FROM INVASIVES

Despite their ability to nest in earthen banks, buildings, and in trees, the Golden Swallow populations that we have interacted with all appear to still share a high susceptibility to depredation by invasive mammals.

While cleaning out and relocating nest-boxes during the February trip, we encountered four nest-boxes (still mounted to trees) in which an invasive rat species (suspected to be *Rattus norvegicus*) was overwintering. The number of rats inside the box ranged from 1 to 4 individuals and escaped via the entrance hole upon being discovered. Two rats, instead of jumping to the ground, ascended quickly into the high branches of the pine tree to which the box was connected, confirming the species' strong arboreal climbing skills. The loss of 40% of our nesting pairs and associated young in 2012 due to these invasive rats was the driving reason for our prompt relocation of all of the nest-boxes from tree trunks to posts with predator guards.

In early June, we received our first notification of a sighting of an introduced Indian Mongoose in the higher altitudes of Parque Valle Nuevo from photographer Eladio Fernandez. Eladio was sitting motionless while photographing GOSW in the Sabana Queliz region when he was approached by a mongoose that was making its way through the thick pajon grass. He reported having to yell aggressively at the mongoose in order to scare it from its initial trajectory towards him. After hearing Eladio's claim and referencing stock photos of this species, Marisol and I can now confidently confirm that indeed it was a mongoose that we saw crossing the road near the entrance to Pajon Blanco in the summer of 2012.

Before erecting predator guards on any of the newly pole-mounted nest-boxes, we wanted to make sure that they were indeed a necessity against the two invasive mammals and furthermore that the thin, metallic structure of the post was not sufficient enough at deterring these climbing predators. On June 9th, we found an adult female with her neck broken inside of her nest-box with her three chicks missing completely. A predator, of some kind, managed to remove the chicks but left the adult behind. This scenario was unfamiliar

to us, as all depredations by rats in 2012 resulted in nearly the complete consumption of the adults (often leaving only the wings. After considerable thought, we have decided that the attack was most likely committed by an animal that could not easily enter the box, but was able to 'reach' into the box, extract the chicks and kill the adult inside before leaving. Either a feral cat or a mongoose would fit that description. Extremely worried that the local population of nesting swallows could be at risk if the attack became a learned behavior, we built and attached predator guards to every active box throughout Valle Nuevo. For the remainder of the breeding season, we did not encounter another depredated box, and have therefore established predator guards as a mandatory necessity in any future nest-box program.

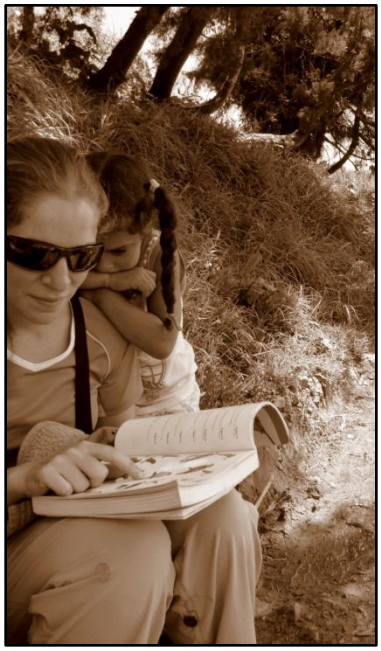
DATA ANALYSIS AND PUBLICATIONS

Extensive data has been collected on morphologies, return rates, fidelity, timing and duration of nesting events, and mortality. Side by side comparisons between data collected in 2012 and 2013 can be found at the end of this report. Full analyses are currently underway, with results expected to be in manuscript form for the following publications later this winter:

THE REPRODUCTIVE LIFE HISTORY STRATEGIES OF A POPULATION OF GOLDEN SWALLOWS IN THE CORDILLERA CENTRAL, DOMINICAN REPUBLIC
Working title; publication in progress; target journal: Journal of Caribbean Ornithology

BEHAVIOR CHANGE IN AN ARTIFICAL NEST BOX POPULATION OF GOLDEN SWALLOWS IN THE CORDILLERA CENTRAL, DOMINICAN REPUBLIC
Working title, publication in progress; target journal: Journal of Caribbean Ornithology

OUTREACH



The outreach portion of the Golden Swallow Project is equally as important as the science. The reality is that the long-term conservation of the project is in the hands of the Dominican people, and we need to make sure that we set the stage for future success when we are no longer able to be an annual presence. That is why we spend just as much time connecting with people as we do with the birds. Their interest, support, and involvement are what will sustain the movement to protect threatened, endemic wildlife. Birds such as the Golden Swallows, with their newly found ability to nest in boxes, can become a powerfully tangible flagship species that can generate support for those species that are equally as important but hidden from public view.

The nest-boxes themselves play the largest role in outreach. It is a rare and often life-changing experience for people to interact with a wild species of bird in such close proximity. With our nest-boxes, we are able to really connect local communities with something they can interact with in nature. The idea is to educate

through hands-on learning in the field, and we have been able to accomplish this by bringing an array of stakeholders, school groups, and organizations into the high altitude pine forests of the national park where they can observe and interact with nesting Golden Swallows.

There are several communities that ring the borders of Parque Valle Nuevo where GOSW have been seen foraging. We decided that erecting nest-boxes in these villages could accomplish several outreach goals simultaneously. Local Dominicans would be helping to build and erect the nest-boxes, in turn establishing a sense of ownership over them which leads to their protection. Once erected, the nest-boxes are a strong stimulator of progressive-minded conversation as well as a visual reminder to the community of their pledge to protect the Golden Swallows. Many of these communities are under continual pressure from the Ministry of Nature to relocate, as their agricultural lifestyles conflict with the ideologies governing the national park. While some individuals fight to remove them, others are able to see the advantages of working with them, and it has been proposed that introducing avenues of ecotourism could offset the communities' economic dependence on the crux of the dispute - destructive agriculture. We are piloting this approach with a set of five nest-boxes in the village of El Castillo erected with the help of community members. With help and guidance from the Caribbean Birding Trail initiative, we will be conducting formal training workshops in many of these communities focusing on developing those skills needed to become marketable birding guides.
We are continuing to increase our presence at the national park's Visitor Center, where much of the present tourism is focused. We erected 8 nest-boxes within viewing distance of the Visitor Center, and additionally donated two pairs of binoculars so that visitors would be able to closely view the GOSW, as well as explore other birding opportunities in the surrounding area. Through our collaboration with Fundación Propagas, we are designing large, free-standing informative posters with information on the life history of the swallows that would be located in the educational interpretive center of the building.

In 2013, we very much wanted to get everyone on the same page with not only what we were doing, but why. We organized two large-scale presentations, one of which was held inside Parque Valle Nuevo targeting the local military and park guards that worked there, while the other was held at the Museo Nacional de Historia Natural in Santo Domingo. Both presentations attracted a respectable number and variety of attendees, as well as helped to strengthen current collaborations and spark new ones. The events were furthermore productive in generating feedback on the project's objectives and generating fresh ideas for future work. We are pushing to establish yearly presentations at the Museo Nacional de Historia Natural that would integrate researchers working with other taxa in the Dominican Republic, so as to encourage a better sense of unity amongst the local scientific community.

The Golden Swallow website (www.thegoldenswallow.org) has been effective in disseminating information, data, and multimedia to large numbers of interested individuals worldwide, while helping the project maintain a high level of transparency. It is the number one fear of those we work with that they will never see results from the research that they have been such a critical part of. In response to this, we make sure that electronic and hard copies of annual reports such as this one are made available to everyone that has been involved.

PROGRESS and FUTURE WORK in the ACETILLAR REGION of the SIERRA DE BAHORUCO

For the past five years in the Sierra de Bahoruco region in the southwest of the Dominican Republic, an array of biologists have attempted to lure a wild population of Golden Swallows into using artificial nest-boxes. Unfortunately, despite the hard work and array of methodologies used, the swallows continue to show a greater preference for other available cavities, the most popular being crevices in the rocky walls of bauxite mines and limestone cliffs. It has been suggested that high natural cavity abundance has downplayed this population's need for novel cavities, rendering the nest-boxes obsolete. The natural cavities, however, are experiencing increased depredation by rats and mongoose, two introduced species that have had extremely negative impacts on the native wildlife across the island (Townsend, 2006).

After recognizing the grim situation during our brief visit in late summer of 2012, we decided that it was time to re-energize the effort to study and protect the Golden Swallow population in the Sierra de Bahoruco.

Hoping a new tactic could bring better success and with the help of Grupo Jaragua's Esteban Garrido, Jairo Isaac Matos (Pirrin), and Gerson Feliz Feliz, on July 4th we erected 20 boxes in the Acetillar Region that are identical in design to those in Parque Valle Nuevo. We mounted the nest-boxes on strong metal posts equipped with predator guard cones and placed them in open areas, some fairly distant from the natural cavities found in the cliff walls. While erecting new boxes, we completed a thorough check of any original nest-boxes remaining from previous investigators. Previous boxes in this region had been mounted against and inside cliff walls, mimicking to great detail the natural cavities being actively used. Nearly half of the boxes were in a state of ruin due to erosional forces acting on the cliff walls, and unfortunately the one and only GOSW nest found had failed due to the collapse of the nest-box. Decomposed remains of young chicks were found in the nesting material which led us to believe that there was no successful fledging from this box. We estimated seven actively nesting pairs of GOSW while traveling through the Acetillar Region, all of which were nesting in the cliff walls of the abandoned bauxite mines. We recognize that this is likely a significant underestimation due to how late we had arrived in the breeding season. Most natural cavities in the rock walls contained chicks ready to fledge (note the chicks visible by their white collars and yellow gapes in the accompanying photo).

Attracting Golden Swallows to nest-boxes equipped with predator guards would allow us to eliminate the growing threat of depredation on the population while additionally opening the doors for an altitudinal comparative study with populations nesting at high-altitudes. Results from a comparative study between populations would generate invaluable information with regards to the species' limitations to breeding success - insight with which we can use to more accurately address regional conservation plans.

Early in the 2014 breeding season, we plan to implement methods of vocal playback as well as wooden decoys to advertise the boxes to nearby Golden Swallows, two tactics that have worked well with congeners. If results are poor, we will return later in the breeding season and attempt to relocate fledging Golden Swallow chicks from adjacent cliff cavity nests into nest-boxes. In this way the chicks will imprint upon and potentially return

to the boxes as adults, at the same time that the adults feeding chicks in the boxes will come to view the boxes as prime nesting sites. Fledgling relocation into nest-boxes is a higher-risk tactic; however the rapid rate of decline of Golden Swallow populations, most notably in the Sierra de Bahoruco, highlights the need for short-term intervention until threats against the species can be minimized. If this methodology produces positive results, it will be a revolutionary 'game changer' in the protection of other threatened Caribbean swallow populations, such as the endangered Bahama Swallow. Nest-box erection and identical methodologies of swallow attraction will take place at other key locations outside of the Acetillar region where swallows have been seen foraging in larger groups in years past. These locations include Zapoten and Hoyo del Pelempito.
Our outreach efforts in the Sierra de Bahoruco aim to establish long-term monitoring programs in the region, which in turn connect communities directly to science and nature conservation. The goal is to continue growing a sense of local stewardship over endemic species such as the Golden Swallow, an ideology that eventually transgresses into protection over ecosystems in their entireties. Members of Grupo Jaragua will continue to monitor the new boxes while searching for other habitats that could be conducive for adding additional boxes in the near future.

PLANS FOR 2014

Ithaca:
This winter season will provide an opportunity to dive into data analysis and the publication of our findings on the life history of the Golden Swallow up to this point. Stay tuned for results and much more insight into the many hypotheses we have only begun to explore in both the 2012 and 2013 Field Season Reports.

Dominican Republic:
Two field seasons (the summers of 2012 and 2013) have been devoted to intensely studying the breeding life history and behavior of the Golden Swallow populations in Parque Nacional Juan Bautista Pérez Rancier. With a long-term monitoring program now successfully established at this site that is generating annual information regarding the demographics, survival, and reproductive success of the species , my attention is drawn to other pertinent questions surrounding the Golden Swallows of Hispaniola. In subsequent field seasons I will be addressing the following two research objectives: (1) Developing a comprehensive distribution map for the species is a priority for conservation management practices as current population estimates, trends, and ranges are based on very limited empirical evidence. We will be conducting extensive surveys into geographically remote regions of the island that have historical records of Golden Swallow activity but lack any contemporary sightings. We aim to build upon the current range maps produced by Birdlife International by incorporating our findings as well as newly identified life history parameters, including habitat and altitudinal preferences. (2) Continuing the effort to attract Golden Swallows to newly designed and erected nest-boxes in the Sierra de Bahoruco mountains is a fundamental stepping stone towards establishing a low-altitude breeding site for the species in the Dominican Republic. Ultimately we would be able to comparatively study changes in life history traits across a wide altitudinal gradient and use this information (i.e. limitations to breeding success) to more accurately address regional conservation plans.

Outreach in 2014 will be strongly focused on integrating the Golden Swallow Project into the Caribbean Birding Trail (CBT), an effort underway by BirdsCaribbean to "*create and promote nature-based, authentic experiences that engage visitors and locals with the unique birds of the Caribbean and connect them to the extraordinary places, diverse cultures and people of each island*." BirdsCaribbean (formerly the SCSCB) is the largest bird conservation organization in the Greater Caribbean and is currently applying for funding via the U.S. Fish and Wildlife Service's Neotropical Migratory Bird grant program to attract ecotourism and stimulate sustainable livelihoods throughout Parque Valle Nuevo using the outreach potential of projects such as ours. This

collaboration might very well become a critical step in securing long-term management over the conservation of the Golden Swallows in this region of the Dominican Republic.

Jamaica:
Throughout the past 18 years, Gary Graves, the Curator of Birds at the Smithsonian's National Museum of Natural History, has been methodically surveying the island of Jamaica in its entirety for any remaining populations of *T. euchrysea euchrysea*, a subspecies of Golden Swallow that is thought to have been extirpated in the late 1980's (Graves, 2013). Though still dependent on funding, we are planning to join Gary in 2014 to help lead a team into some of the more remote, less 'birded' regions of Jamaica in a final effort to search for a so-far undetected relic population.

FRIENDS and SUPPORTERS of the GOLDEN SWALLOW

In an effort to support local stewardship over this endemic bird as well as secure the sustainability of the research, the thesis has fundamentally grown from its initial scientific study to a multi-faceted collaboration called the Golden Swallow Project. An array of groups and organizations are taking responsibility for different aspects of the project, including educational outreach on the community level, partnerships with local universities, nest box monitoring programs, and study-site amplification.

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- Ministerio de Medio Ambiente
- La Sociedad de Ornitología

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Data Tables (2012 and 2013)

EGGS

2012	Length (mm)	Width (mm)	Mass (g)
Sample size (n)	127	127	121
Average	18.34	13.16	1.70
Range	15.7 to 20.36	12.25 to 14.0	1.36 to 2.13

Clutch range: 2 – 4 eggs
Average clutch size (n=51): 2.96 eggs

2013	Length (mm)	Width (mm)	Mass (g)
Sample size (N)	68	68	68
Average	18.8	13.21	1.75
Range	16.68 – 21	12.33 – 13.79	1.45 – 2.15

Clutch range: 2 – 4 eggs
Average clutch size (n=45): 3.07 eggs

INCUBATION

2012	Average Time	Range
N = 36 nests	17.78 days	17 – 21 days

2013	Average Time	Range
N = 35 nests	17.89 days	17 – 19 days

CHICKS

2012				
Day	**N=**	**Head-bill**	**Wing**	**Mass**
		(mm)	(mm)	(grams)
3	48	15.2867	8.03958	3.81146
6	48	18.5375	13.8229	7.56479
9	48	21.0102	23.7021	11.524
12	49	22.9188	37.9776	14.1994

2013				
Day	**N=**	**Head-bill**	**Wing**	**Mass**
		(mm)	(mm)	(grams)
3	57	14.7918	7.71579	3.30298
6	53	18.0643	12.6925	7.02868
9	51	20.8075	22.5329	11.1775
12	37	22.2724	35.9865	13.6149

FLEDGING

2012 N = 8 nests	Minimum	Maximum	Average
Age upon fledging event (days)	25	27	25.875

2013 N = 3 nests	Minimum	Maximum	Average
Age upon fledging event (days)	25	26	25.33

MORTALITY

	2012		2013	
	Depredation	Abandonment	Depredation	Abandonment
Adults	>6	0	1	0
Chicks	14	24	4	17

ADULTS

Captures

	2012		2013	
Sex	Female	Male	Female	Male
Captured	42	2	39	19
Recaptured	3	0	23	1

Morphology

MALES_2012	Head-bill (mm)	Wing Length (mm)	Mass (g)
Sample size (n)	2	2	2
Range	25.45 to 25.7	115 to 117	11.23 to 11.41
Average	25.58	116	11.32

MALES_2013	Head-bill (mm)	Wing Length (mm)	Mass (g)	Bill Length	Tail
Sample size (n)	18	18	18	18	18
Range	25.3 – 26.72	112.5 – 119.5	11.1 – 13.07	4.0 – 4.95	53.0 – 59.0
Average	26.2	116.25	12.35	4.49	56.06

FEMALES_2012	Head-bill (mm)	Wing Length (mm)	Mass (g)
Sample size (n)	41	41	41
Range	25.35 to 26.9	106 to 114.5	11.02 to 14.58
Average	26.1	110.07	13.21

FEMALES_2013	Head-bill (mm)	Wing Length (mm)	Mass (g)	Bill Length	Tail
Sample size (n)	36	36	35	36	36
Range	24.6 – 26.95	104.0 – 115.0	11.43 – 15.22	4.21 – 6.0	47.0 – 56.5
Average	26.003	111.19	13.07	4.73	51.91