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NATURE-BASED

TOURISM AND BIRD CONSERVATION. THE CASE OF THE WHITE-COLLARED SWIFT (STREPTOPROCNE ZONARIS) IN CUBA

TURISMO DE NATURALEZA Y CONSERVACIÓN DE LAS AVES. EL CASO DEL VENCEJO DE COLLAR (STREPTOPROCNE ZONARIS) EN CUBA

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ABSTRACT

The trend to increase outdoor activities related to nature-based tourism raises concern among researchers and conservationists due to the potential impact on wildlife. Among the places experiencing increasing pressure are the sites of bird's concentration, such as nesting colonies. Topes de Collantes (south-center Cuba) is a protected area where the largest nesting colonies of White-collared Swift are found in Cuba. In the work is evaluated if the tourist activity interferes with the key elements of the reproductive biology of the species (the breeding chronology, the limiting factors to establish a nesting colony and the peaks of activity during the day at nesting colonies) in three study sites at Topes de Collantes. The impacts of recreational activities and the interaction between visitors and birds were determined by direct observation through walks within the studied sites, their surroundings and trails. We did not detect direct impacts of visitors in either of the three nesting colonies evaluated, where we observed an effective space-time segregation. However, the presence of alien species and damage to cave walls by graffiti requires management strategies, including guidance and environmental education.

Keywords: Breeding chronology, cypseloidines swifts, space-time segregation, Topes de Collantes, touristic activities impacts.

RESUMEN

La tendencia al aumento de las actividades al aire libre relacionadas con el turismo de naturaleza genera preocupación entre investigadores y conservacionistas debido al impacto potencial sobre la vida silvestre. Entre los lugares que experimentan una mayor presión son los sitios de concentración de aves, como las colonias de nidificación. Topes de Collantes (centro-sur de Cuba) es un área protegida donde se encuentran las mayores colonias de nidificación de Vencejo de Collar de Cuba. Se evaluó si la actividad turística interfiere con los elementos clave de la biología reproductiva de la especie (la cronología reproductiva, los factores limitantes para establecer una colonia de anidación y los picos de actividad durante el día en las colonias de nidificación) en tres sitios de nidificación del área. Los impactos de las actividades recreativas y la interacción entre visitantes y aves se determinaron por observación directa a través de caminatas dentro de los sitios de estudio, sus alrededores y senderos. No se detecta impactos directos de los visitantes en las tres colonias de nidificación evaluadas, donde se observa una efectiva segregación espacio-temporal. Sin embargo, la presencia de especies exóticas y el daño a los sitios (las paredes de las cuevas) por graffiti requiere estrategias de manejo, que incluyan orientación y educación ambiental.

Palabras clave: Cronología reproductiva, impactos de actividades turísticas, segregación espacio-temporal, Topes de Collantes, vencejos cypseloidines.

INTRODUCTION

As a result of human population increase, mobility and free time, presence of visitors in many areas of conservation interest are also increasing (Gill & Sutherland, 2000). It has been estimated that there are more than eight billion visitors per year to terrestrial natural areas (Balmford et al., 2015), with the consequent influence on wildlife and on, important changes at a global level (Gaynor et al., 2018). This trend raises concern among researchers and conservationists due to the potential impact of recreation activities on wild animals (Bötsch ***et al***., 2018). Such impacts can arise after low-intensity disturbance events, even when they occur over a short period of time (Bötsch et al., 2017). This situation is aggravated by the rapid expansion of outdoor recreation activities into undisturbed landscapes (Cordell ***et al***., 2008), which has been showing an increasing trend in recent decades (Hammitt ***et al***., 2015).

Human disturbance in natural landscapes and therefore on fauna can be direct or indirect. One of the direct ways is the recreational use of their places. According to Bötsch ***et al***. (2017), many investigations have evaluated the impacts of outdoor recreational activities on wildlife, such as the effect of man-made structures and human presence in those spaces. Despite the growing number of studies about human-wildlife interactions, most of them focus on protected areas and vertebrate species (mainly birds and mammals), and the effects remain unpredictable. This is due to the complexity of globally targeting wildlife-recreational activities and wildlife responses to human activities (Lilimona, 2001), which include changes in behavior and the distribution of species, depending on the type, intensity and frequency of the disturbance (Gaynor ***et al***., 2018).

However, wildlife and recreational activities can coexist at a variety of spatial, temporal, and behavioral levels, but management requires cooperation among users of public spaces (Knight & Temple, 1995). This should be based on information on the reproductive and behavioral parameters and natural history of the target species, and the proper use of that information to create management tools for natural resource managers.

One of the places that attracts visitors, especially for bird-watching, are the sites where birds concentrate, such as migratory routes, resting sites and nesting colonies. Among the colonial birds that attract attention in different parts of the world are the swifts. Four species of swifts have been recorded in Cuba, and one of them is the White-collared Swift (Streptoprocne zonaris), with a distribution restricted to the mountains systems of the center and east of the island (Garrido & Kirkconnell, 2011). Like in the rest of the world, Cuba has experienced an increase in the demand for nature based-tourism products, due to a distinctive biodiversity with high landscape values and endemism. This situation has increased the pressure on them. However, the relationship between conservation and nature-based tourism has been little addressed in this country.

The Topes de Collantes Protected Natural Landscape, located at the mountains in the center of Cuba, has experienced increased pressure, being one of the most important destinations for nature-based tourism in the island. Some of the excursions include the nesting places of the White-collared Swift that have so far been reported in Cuba (Montes, 2019). This bird with colonial habits and a wide distribution in America has been little studied, due to the inaccessibility of its roosts and nesting sites (Marín, 2016). Montes (2019) provides relevant information on its natural history and reproductive biology in Cuba. However, even in extensive studies on the ecology of Cuban birds, the effects of nature-based tourism have not been identified to establish management strategies focused on the conservation of this group, especially swifts.

The aim of this study was: 1) identify punctual aspects of the reproductive biology of the Whit-collared Swift in Topes de Collantes that can contribute to the adoption of management measures for the nesting sites of this bird; and 2) propose actions for management and conservation of the species based on these results.

MATERIALS AND METHODS

The study was carried out in Topes de Collantes Protected Area, located in the Guamuhaya Mountain Group, south central Cuba (80°07'25''N: 21°48'33''W; 79°54'08''N: 21°59'20''W). This area has an extension of 175, 42 Km^2 and is located 931 m.s.l. The climate is tropical with a very humid summer, with the predominance of different forest formations. The high endemism is favored by the altitude and climatic differences that have led to the establishment of different ecosystems. We studied three nesting colonies named La Batata Cave, Vegas Grandes Waterfall and El Colín Canyon (Figure 1).

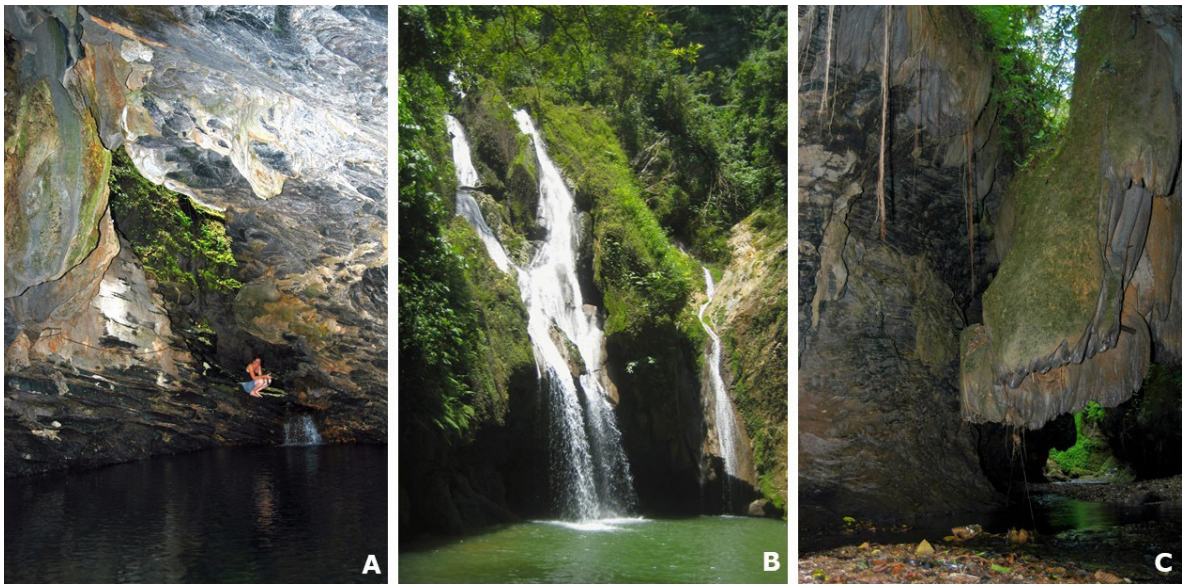

Figure 1. The three nesting colonies of the White-collared Swift studied in Topes de Collantes. A: Batata Cave, B: Vegas Grandes Waterfall, C: El Colin Canyon. Source: our elaboration

These sites have been extensively described by Montes (2019). All of them are characterized by being associated with active watercourses year around, a stable microclimate with high relative humidity. They are one of the most visited destinations by visitors to the park due to their relative proximity to the facilities and hotels.

We analyzed if the tourist activity interferes with the key elements of the reproductive biology of the species. We selected: 1) the breeding chronology; 2) the limiting factors to establish a nesting colony; and 3) the peaks of activity during the day at nesting colonies, as key elements of the reproductive biology of the species. These aspects have been widely described by Montes (2019). The impacts of recreational activities and the interaction between visitors and birds were determined by direct observation through walks within the studied sites, their surroundings and trails.

RESULTS AND DISCUSION

The breeding season is one of the most intense moments for birds, with a strong demand of energy for breeders. For this reason, it is important to evaluate the events that affect wild populations during this time, especially those of anthropic origin, such as nature-based tourism.

The reproductive chronology

The breeding chronology establishes the moment in the year in which the reproduction of a species occurs. In most temperate bird species, it is related to day length. In the case of species from tropical areas, it is more related to rainfall. That it is the case of White-collared Swifts (Passeggi, 2011). Through the breeding chronology, changes in species cycle can be determined, and related to alterations in the environment. It also allows evaluating the bird behavior and reaction to different stimuli. In the case of the White-collared Swift, the reproductive period in Cuba last from April until July (Montes, 2019). It starts with the nest construction, followed by the egg laying and incubation, which lasts approximately 18 days (Figure 2). Then nestling growth starts (from the end of May to the middle of June), and chick's independence and flight occurs in mid-July. Such a breeding season of the White-collared Swift coincides with the summer holidays in Cuba and other parts of the world, which means an increase in touristic visits and possible interactions with birds with.

Figure 2. White-collared Swift in the nest during incubation (detail of a coolin egg event). Source: our elaboration

Limiting factors to establish a nesting colony

There is a group of factors that determine the establishment of bird nesting colonies. These factors vary between species as well as geographically and encourage them to adopt strategies to adapt to the environment in which they breed. These factors are closely related to the availability of resources (food, nest building materials, shelter) and the presence of predators. One of the characteristics of the cypseloidine swifts is the use of sites associated with rocky walls, caves and waterfalls for their nesting colonies (Marín, 2016), that provide microclimatic stability and high relative humidity (Gunn et al., 2012)y(Marín, 2016), and availability of materials to build the nests (Montes, 2019). In this group of birds there is a preference for the use of plants with rocky growth habits, present within the sites used for nesting, such as mosses and ferns (Marín, 2016). Montes (2019) proposed the hypothesis that the presence of these materials inside the resting site may condition the establishment of a White-collared Swift nesting colony in them.

Peaks of activity during the day at nesting colonies

Birds show peaks of activity during their life cycle (migration, reproduction) that can vary by years but also during the day. These peaks of activity carry an extra expenditure of energy and can lead to additional stress depending on changes in the environment and the expertise of breeders. Montes (2019) determined that the White-collared Swift has two peaks of activity in the day during the breeding season. One of them occurs between sunrise and 9:00 am., and the second between 5:30 pm and sunset. These peaks are related to the construction of the nest and chicks feeding. In this period, Montes (2019) observed that visitors remain at the nesting sites approximately from 9:00 a.m. until 4:40 p.m. During the incubation period, the presence of birds in the nests is not noted by visitors. This is due to the poor lighting in most of the sites where the nests are, the secretive behavior of breeding adults in the nest, and the black color of them.

Impacts of recreational activities

We did not detect direct impacts from visitors such as destruction of nests, collection of eggs, chicks or adults, nest destruction or abandonment, or chicks fall from the nest. But we did detect indirect impacts such as the presence of invasive alien species, specifically rats (***Rattus sp.***). This species could be the reason of the depredation of swifts that we recorded in the Batata Cave (Figure 3).

Figure 3. Evidence of the predation of adult of White-collared Swift (***Streptoprocne zonaris***) presumably by rats (***Rattus sp.***) in the Batata Cave. Source: our elaboration

Other problems related to the presence of visitors in the nesting colony are the food scraps, and garbage left by them. Also we noted graffiti on the interior walls of the caves inside and around the nesting colonies site, especially on the areas covered by moss (Figure 4).

Figure 4. Evidence of indirect impacts of tourist activity on the nesting colonies of the White-collared Swift in Topes de Collantes. Source: our elaboration

Another disturbance that we detected was the noise caused by visitors, but this apparently doesn't affect the birds that remain inside the nesting colony during the day. (Hill et al.,1997).

The interactions between wildlife and nature-based tourism will rise in correspondence with the increase in demand for these recreational products, following the trend of the last decades pointed out by (Hammitt et al., 2015). For many natural areas, especially protected ones, one of the most important services is to provide an attractive destination for nature-based tourism; but this can be influenced in complex ways by how it is managed (Chung et al., 2018).

If we consider that recreational activities have negative effects on the distribution and reproductive success of birds (Laursen et al., 2017), the growing demand for nature-based tourism products and their important economic inputs, it is urgent to adopt management strategies that help reconcile outdoor activities and biodiversity conservation. However, this will require wise spatial planning combined with education and information transfer on environmental issues and wildlife-friendly behavior to minimize disturbance (Laursen et al., 2021). But this information can only be provided by basic information on the ecology and natural history of the species, also very much needed.

Determining the reproductive period of the species, the different phases and its critical moments (during the day as well as during the year) allow the implementation of measures to minimize the disturbance in the nesting colonies. In our case study, the breeding season of the White-collared Swift coincides with the summer holidays, but this did not mean an increase in direct interactions between visitors and birds. This was due to the usual secretive behavior of the species. Even with the little interaction that we detected, it is prudent to adopt measures to establish a certain distance between visitors and the nests of the swifts. The spatial segregation has been proposed by Gundersen ***et al***. (2019) as a strategy to minimize conflicts between tourist use and the conservation of key species. With it, the aim is to avoid the coincidence of species and humans in a given space at the same time. It is also possible to apply spatial segregation by displacing the most intense touristic activities away from the concentration of the nests. These concentrations are easy to determine through a census. In the case of the nesting colonies of the White-collared Swift in Topes de Collantes, it is important to determine in which cave chambers the greatest number of nests are found, and thus limit the number of visitors and the most intense activities in them.

The two peaks of daily activity for the White-collared Swift do not coincide with excursions to their nesting colonies. So the visitors do not interfere with the events of the bird's reproduction. In this case, a temporary segregation occurs naturally. We emphasize the importance of ensuring that the excursions begin after 9:00 am and end before 5:00 pm to ensure this temporary segregation.

The impacts of nature-based tourism activities have been widely discussed (Gaynor ***et al***., 2018) (Bötsch ***et al***., 2017). One method to assess the impacts of nature-based tourism on wildlife bird populations is the monitoring of invasive alien species. This type of monitoring in the areas near nesting colonies or other congregation sites allows the necessary measures to be taken to minimize the damage that they may cause to wildlife in a timely manner. In the Topes de

Collantes protected area, it may be opportune to include to its management projects the monitoring and control of invasive alien species that have been duly identified by specialists.

One variable that we did not measure was the duration of nest neglect after being disturbed by visitors. Montes (2019) measured it for the researchers' disturbance, and the results suggest that this variable could be used to determine the degree of disturbance during incubation and the first moments of nestling. To determine the degree of disturbance through this variable, it is necessary to design a measurement-observation experiment that allows establishing the tolerance limit of the birds to the disturbance caused by visitors. This would be especially useful during incubation, the most critical moment of the breeding season of the White-collared Swift. This is because the highest number of nest failure is recorded at this stage Gil & Sutherland (2001).

Another issue to take into account is the disturbance caused by the use of different technology, such as lights or devices that generate noise and sound such as music or calls. Mesquita ***et al***. (2020) evaluated drone disturbance in a White-collared Swift colony, concluding that the drone noise may lose importance for the disturbance, while the visual aspects such as the shape or the flight pattern can be determinant for the swift's behavior change. The recreational use of drones is not widespread in Cuba, so it is not a problem to face, but it is something to take into account for the future if it were to become a relatively common practice. At the moment, the impact generated by these technologies has been little evaluated, with the exception of the recreational and research use of drones. However, presumably the indiscriminate use of technological devices in natural spaces can generate responses from wildlife related to behavioral and physiological changes with different levels of intensity. These types of responses can have a negative impact on the reproductive process in the case of birds in their breeding season, since it causes the individual to spend more energy, alters the incubation cycle and the care of altricial nestlings and exposes them to possible predators (Mesquita ***et al***., 2020).

Finally, visitor's guidance is an effective conservation measure to reduce the negative impacts of recreationists (Bötsch ***et al***., 2018). In Topes de Collantes, the tour guides are usually people from the community and show extensive knowledge of the area and preparation in guidance techniques. But they must take into account that the human presence per se causes important disturbance to birds in recreational areas (Bötsch ***et al***., 2018). That is why they must pay special attention to changes, especially behavioral changes of the species, as well as that of the visitors they guide.

CONCLUSIONS

Tourism activities in natural landscapes and biodiversity conservation can coexist if a group of strategies such as spatial and temporal segregation are established. One way to evaluate and minimize indirect impacts is through the monitoring and control of populations of invasive alien species. It is also vitally important to educate visitors about their responsibility to help minimize these impacts. The training of guides and managers of interest sites for practice nature-based tourism can be decisive.

The evaluation of the breeding chronology, the limiting factors to establish a nesting colony and the peaks of activity of the nesting colonies allow to identify the moments in which it is necessary to adopt measures to minimize the impacts of nature-based tourism on them. In the case of the nesting colonies of the White-collared Swift in Topes de Collantes, it is effective the spatial and temporal segregation between birds and visitors. Despite the actions of the administration of the Protected Area and Touristic Complex to maintain the cleanliness of the trails, place garbage collectors and educational actions, the indirect impacts have caused the incidence of exotic rodents. The behavior of some visitors, such as graffiti on the walls, causes the loss of material to build the nests (mosses, ferns and other plant species), a determining element for the establishment of nesting colonies of this species.

REFERENCES

Balmford, A., Green, J. M. H., Anderson, M., Beresford, J., Huang, C., Naidoo, R., Walpole, M. & Manica, A. (2015). Walk on the wild side: estimating the global magnitude of visits to protected areas. PLoS Biol., 13: e1002074.

Bötsch, Y, Tablado, Z. & Jenni, L. (2017). Experimental evidence of human recreational disturbance effects on bird-territory establishment. Proc. R. Soc. B., 284: 20170846.

Bötsch Y, Tablado, Z., Scherl, D., Kéry, M., Graf, R. F. & Jenni, L. (2018). Effect of Recreational Trails on Forest Birds: Human Presence Matters. Front. Ecol. Evol., 6: 175.

Chung, M. G., Dietz, T. & Liu, J. (2018). Global relationships between biodiversity and nature-based tourism in protected areas. Ecosystem Services, 34: 11–23.

Cordell, H. K., Betz, C. J., Green, G. T. (2008). Nature-based outdoor recreation trends and wilderness. Int. J. Wildland Fire, 14: 7–10.

Garrido, O. H. & Kirckonnell, A. (2011). Aves de Cuba. Cornell University Press.

Gaynor, K. M., Hojnowski, C. E., Carter, N. H., Brashares, J. S. (2018). The influence of human disturbance on wildlife nocturnality. Science, 360: 1232–1235.

Gil, J. A., Norris, K. & Sutherland, W. J. (2001). The effects of disturbance on habitat use by black-tailed godwits ***Limosa limosa***. Journal of Applied Ecology, 38: 846–856.

Gil, J. A. & Sutherland, W. J. (2000). Predicting the consequences of human disturbance from behavioural decisions. En: Gosling, L. M. & Sutherland, W. J. (Ed). Behaviour and Conservation. Cambridge University Press.

Gundersen, V., Vistad, O. I., Panzacchi, M., Strand, O. & van Mooter, B. (2019). Large-scale segregation of tourists and wild reindeer in three Norwegian national parks: Management implications. Tourism Management, 75: 22–33.

Gunn, C., Potter, K. M. & Beason, J. P. (2012). Nest Microclimate at Northern Black Swift Colonies in Colorado, New Mexico, and California: Temperature and Relative Humidity. The Wilson Journal of Ornithology, 124(4): 79-802

Hammitt, W. E., Cole, D. N. & Monz, C. A. (2015). Wildland Recreation: Ecology and Management. John Wiley & Sons.

Hill, D., Hockin, D., Price, D., Tucker, G., Morris, R. & Treweek, J. (1997). Bird disturbance: improving the quality and utility of disturbance research. Journal of Applied Ecology, 34: 275–288.

Knight, R. L., & Cole, D. N. (1995). Wildlife Responses to. ***Wildlife and recreationists: Coexistence through management and research***, ***51***.

Laursen, K., Bregnballe, T., Therkildsen, O. R., Holm, T. E. & Nielsen, R. D. (2017). Disturbance of waterbirds by water-based recreational activities – a review. Dansk Ornitologisk Forenings Tidsskrift, 111, 96–112.

Laursen, K., Kaae, B. C., Bladt, J., Skov-Petersen, H., Clausen, P., Olafsson, A. S., Draux, H. & Bregnballe, T. (2021). Countrywide screening of spatiotemporal overlap between coastal and marine recreation and waterbirds in Denmark. Journal of Outdoor Recreation and Tourism 35: 100399..

Marin, M. (2016). Breeding biology and natural history notes for White-collared Swift ***Streptoprocne zonaris*** in Costa Rica. Bull. British Ornithologists' Club, 136: 199-208.

Mesquita, G. P., Rodríguez-Teijeiro, J. D., Wich, S. A. & Mulero-Pázmány, M. (2020). Measuring disturbance at a swift breeding colonies due to the visual aspects of a drone: a quasi-experiment study. Current Zoology, 16 (2): 157-163. DOI: 10.1093/cz/zoaa038.

Montes, R. (2019). Biología reproductiva y conservación del vencejo de collar (***Streptoprocne zonaris***) en el centro sur de Cuba. Tesis doctoral. Universidad de Alicante.

Passeggi, J. M. (2011). First description of the breeding chronology of the White-collared Swift (***Streptoprocne zonaris***) in Argentina. The Wilson Journal of Ornithology, 123:613-618.