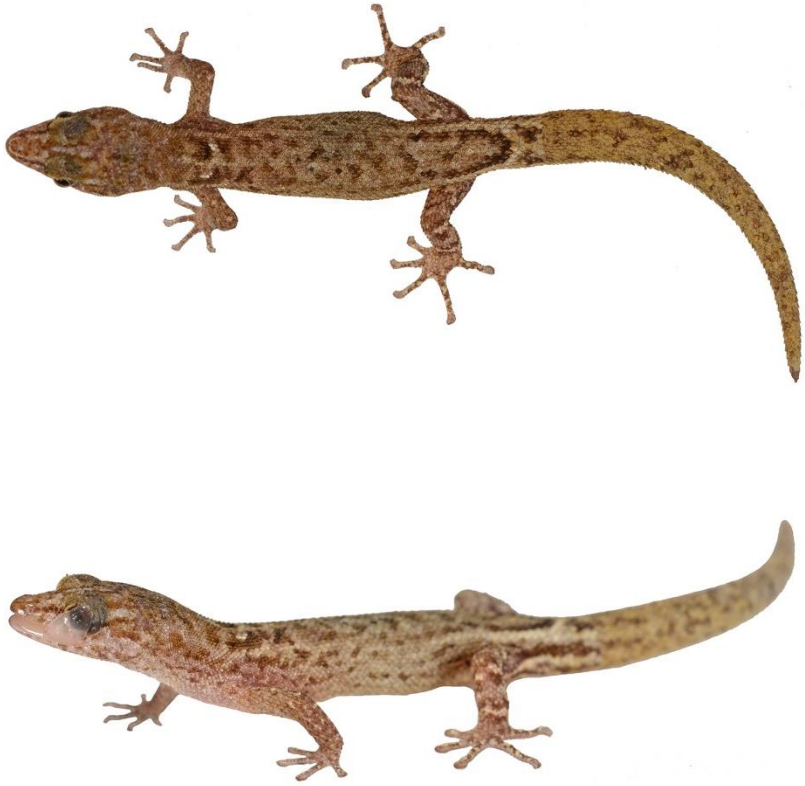
Monito gecko
(*Sphaerodactylus micropithecus*)

5-Year Review:
Summary and Evaluation



Photos by JP Zegarra (USFWS)

U.S. Fish and Wildlife Service
Southeast Region
Caribbean Ecological Services Field Office
Boquerón, Puerto Rico

5-YEAR REVIEW
Monito gecko / *Sphaerodactylus micropithecus*

I. GENERAL INFORMATION

A. Methodology used to complete the review:

On September 21, 2007, the U.S. Fish and Wildlife Service (Service) published a notice in the *Federal Register* (72 FR 54061) announcing the 5-year review of 18 Caribbean species, and requesting new information concerning the biology and status of these species. This notice included the Monito gecko (*Sphaerodactylus micropithecus*). A 60-day comment period was opened; however, no information on the Monito gecko was received from the public during the comment period.

The lead Service recovery biologist prepared this 5-year review, which summarizes new information gathered since this species was listed in 1982 (47 FR 46090), and since its recovery plan was signed on March 27, 1986 (USFWS 1986). This document is based on the available information in our species files, distribution and status reports, information obtained from two recent field visits to Monito Island, and the best available information on the species' biology and ecology. Sources of information included the final rule listing the Monito gecko under the Endangered Species Act, the species' recovery plan, peer-reviewed literature, unpublished field observations, reports by Puerto Rico Department of Natural and Environmental Resources (PRDNER) and Service biologists, and communications from other qualified biologists and experts.

The Service did not seek additional peer review for this 5-year review since Service biologists and participating PRDNER biologists during the recent trips to Monito Island (May 2014 and 2016) are the lead Federal and State recovery biologists on the Monito gecko. No part of the review was contracted to an outside party.

B. Reviewers

Lead Region: Kelly Bibb, Recovery Coordinator, Southeast Region, Atlanta, Georgia. Telephone: 404-679-7132.

Lead Field Office: Jan P. Zegarra, Caribbean Ecological Services Field Office, Boquerón, Puerto Rico. Telephone: 787-851-7297, ext. 220.

C. Background:

1. **Federal Register Notice citation announcing initiation of this review:** 72 FR 54061; September 21, 2007.

2. **Species status:** Improving. Rat predation, the species main threat, has not been present for more than 10 years after the rat eradication campaigns were completed in 1999. The only systematic survey for the Monito gecko was completed in May 2016 and showed that the Monito gecko is abundant across the Island and appears to number in the thousands, indicating a large healthy population (Angeli 2016).

3. **Recovery achieved:** 4 (4 = 76-100% species' recovery objectives achieved). The species main threat (i.e., rat predation) has been eliminated. A rapid assessment was completed in May 2014 and a systematic population survey was completed in May 2016. As we have learned more about this gecko, we have determined that some of the recovery actions are now obsolete and not necessary for further recovery. Throughout this document, we discuss the best and most recent available information for the species, recovery actions, and future recommendations. We believe it is appropriate to consider the species for delisting based on the lack of threats and achievement of recovery objectives.

4. **Listing history**
   Original Listing
   FR notice: 47 FR 46090
   Date listed: October 15, 1982
   Entity listed: Species
   Classification: Endangered

5. **Associated rulemakings:** None.

6. **Review History:**
   Final Recovery Plan: 1986

   Each year, the Service reviews and updates listed species information to benefit the required Recovery Report to Congress. Through 2013, we did a recovery data call that including showing status recommendations, such as "Stable" for this reptile. We continue to show that species status recommendation part in our 5-year reviews. The most recent evaluation for Monito gecko was completed in 2016.

   Five Year Review: November 6, 1991. In this review (56 FR 56882), different species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors as they pertained to the different

species' recovery. In particular, no changes were proposed for the status of this gecko in the review.

7. **Species' Recovery Priority Number at start of review (48 FR 43098):** 5. At the time of listing, the Monito gecko was recognized as a species with high degree of threat and low recovery potential.

8. **Recovery Plan**
   Name of plan: Monito Gecko Recovery Plan
   Date issued: March 27, 1986

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

1. **Is the species under review listed as a DPS?** No

2. **Is there relevant new information that would lead you to consider listing this species as a DPS in accordance with the 1996 policy?** No

B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?** The Monito gecko has a final recovery plan, but it is outdated and does not contain criteria. The Plan recommends conducting a systematic status survey and ecological studies of the species, before initiating specific recovery actions for the Monito gecko.

2. **Adequacy of recovery criteria.**

   a. **Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?** When the Service approved the Plan, additional information about the species' past and present population levels was needed, precluding the formulation of quantitative recovery criteria (USFWS 1986).

   b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?** Since quantitative recovery criteria have not been developed, this question does not apply.

3. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:**

The Plan does not contain criteria: however, it provides recovery objectives that, when accomplished, will aid in developing recovery criteria leading to delisting the Monito gecko. The Plan describes the recovery objective as to bring the Monito gecko population to a level where it can be delisted. No quantitative recovery level was defined due to the lack of data on historical population levels, population trends, and apparent historical population size.

The objective of the Plan is to conduct a systematic status survey and ecological study of the species, and to re-evaluate the species' status and formulate a quantitative recovery level and specific recovery actions (USFWS 1986). The recovery objectives were accomplished as follows:

Recovery actions 1 and 2: Determine the status of the species and conduct basic ecological studies.

Since the description of the species (Schwartz 1977), several Monito gecko surveys were conducted (see Table 1, Section C.1.a. of this review for surveys from 1982 to 1993). However, some of these surveys were either done previous to the Recovery Plan (USFWS 1986), did not provide enough information to answer the population objectives of the Recovery Plan, or current information suggest surveys were biased. These surveys were conducted during the day, when the Monito gecko seems to be less active and hiding under rocks, debris, inside crevices or other substrates. The Service had suspected the Monito gecko is more active at night and thus easier to detect during night surveys. Monito gecko nighttime activity was confirmed during the 2014 assessment and 2016 survey. A rapid assessment of the gecko was completed in May 2014 and a systematic population survey was completed in May 2016. Overall, the Monito gecko is abundant across the Island and appears to number in the thousands, indicating a large healthy population (see Section II.C.1.a. of this review for more details on the evaluations and determinations from the most recent survey).

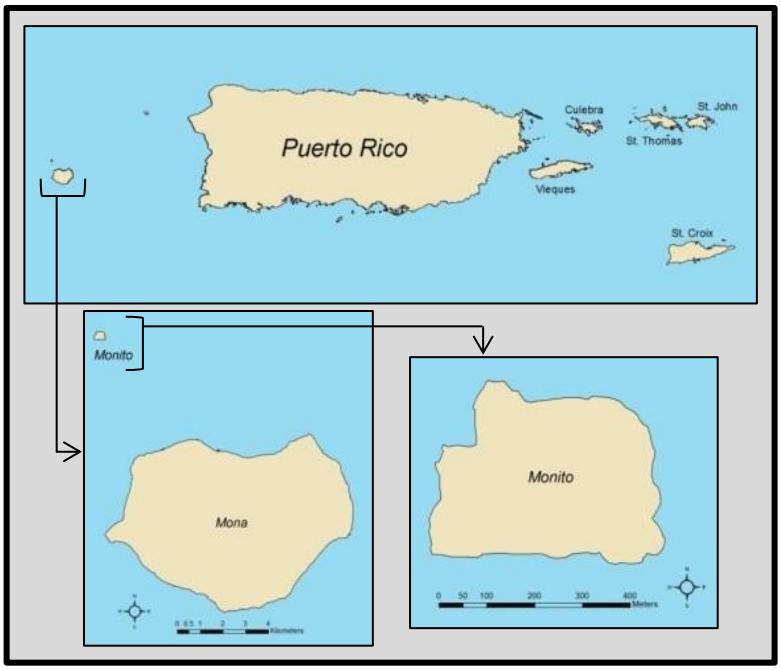
The nocturnal behavior of the gecko is a key ecological trait to consider for previous and future surveys. We will further discuss any possible needs of ecological evaluations in relation to post delisting monitoring with our partners but we likely will not need detailed research on their biology based on the status of threats in their native habitat on Monito Island.

Recovery action 3: Determine extent, if any, of predation and competition by rats and native reptiles.

The presence of rats in Monito Island (Figure 1) was the main reason why the Monito gecko was listed. Although predation has never been

reported (USFWS 1986), this threat was suspected to be the main cause of an apparent population decline for the Monito gecko. In addition, the net effect, if any of the potential rat predation on the geckos has been debated. For example, in the final listing rule for this species, Dr. H. Campbell indicated that the scarcity of the Monito geckos was an artifact of the intense predation by black rats (*Rattus rattus*), while Dr. A. Schwartz doubted that rats could have any effect on the gecko or its eggs (47 FR 46091). The potential effect of rats on other small geckos like the nearby Mona Island gecko (*Sphaerodactylus monensis*), a relatively common species, is also unknown.

Figure 1. Location of Monito Island.



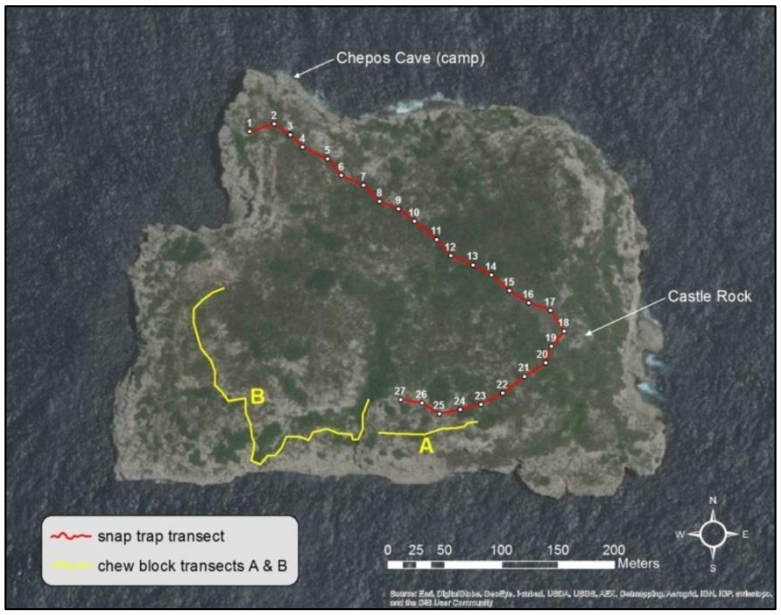
In October 1992, the PRDNER began a black rat eradication and survey project on Monito Island (Figure 1) to benefit the native and endemic species present on that Island (García et al. 2002). The eradication campaign continued in March 1993 with rodenticide and using snap traps to assess changes in the rat population. A second eradication campaign started in October 1998, with three poisoning (i.e., rodenticide) events at four month intervals, and again using snap traps in addition to chew blocks (i.e., soft wood pieces soaked in canola oil) as a monitoring tool.

García et al. (2002) evaluated the status of the rat population seven times during the first campaign and five times during the second campaign. Since the completion of the second poisoning campaign (August 1999), no rats have been detected on Monito. García et al. (2002) concluded

that in order to be certain that eradication had been achieved, it was essential to continue an appropriate rat monitoring program on the Island. The authors recommended using chew blocks. However, no systematic rat monitoring had been implemented on the Island since September 1999. Nonetheless, during a seabird blood sampling trip in August 2000, Anderson and Steeves (2000) reported not seeing any rats on Monito Island, as did subsequent PRDNER bird survey trips in 2003.

During May 6-8, 2014, the Service organized an expedition to Monito Island (Figure 1) in order to confirm the eradication of black rats from the island, and to evaluate the status and threats of the Monito gecko. The Service and the PRDNER placed 27 snap traps and 70 chew blocks distributed along transects covering 870 meters in length (Figure 2). In addition, we intentionally left some food items (i.e., watermelon, left over tuna cans) exposed and available for rats. No signs of rat were detected on these available sources during this 4 day/3 night trip. During May 5-9, 2016, the Service and the PRDNER also placed 80 chew blocks, two within each gecko sampling plot (refer to Figure 3 on page 10). Rats were not seen nor detected within the chew blocks during this 5 day/4 night trip. This is a marked difference from when the species was listed in 1982, when rats were observed island-wide at all times during a two-day expedition (47 FR 46090).

Figure 2. Monito Island with referenced locations and transects during the May 2014 assessment.



Although it cannot be ascertained when the last rat died, the Service believes Monito Island has been rat free since August-September 1999. Thus, the main threat to the species has not been present for more than

10 years. Although there is no historical or consistent population numbers of the Monito gecko to determine trends of the species, the species has demonstrated resilient attributes (e.g. habitat generalist, potential high survival rate) for long-term persistence in the face of disturbances (i.e., apparent rat predation and previous bombing effects).

Other lizards (i.e., *Anolis monensis* and *Spondilurus monitae*, formerly *Mabuya mabouya sloani*) that naturally occur on the island may also predate on the Monito gecko. These species are considered diurnal, while the Monito gecko seems mostly nocturnal. In fact, besides thermoregulatory adaptations, the gecko's nighttime activity may have been a trait that developed in order to avoid and reduce predation during the day, especially from the abundant *Anolis monensis* population on the Island. Determining the extent of these potential predator-prey interactions would be challenging. However, this should not be necessary as the species has persisted despite potential predatory threats and there is no indication that the magnitude of an undetermined natural predation pressure is critical to the gecko's recovery or listing status.

Recovery action 4: Update Recovery Plan

Because of the information provided in this 5-year review on threats and recovery progress, we believe the Monito gecko should be considered for delisting. A formal update of the 1986 Recovery Plan is not needed to consider delisting.

Recovery action 5: Continue protection of the present population

Monito Island has been protected by the PRDNER as a nature reserve since 1985 (Morales 1985). There are no permanent residents on the Island and access is only allowed under special permits issued by the PRDNER, whom also maintains a Ranger detachment and biologist on nearby Mona Island. Monito Island also is visited by illegal immigrants. The frequency of these events varies from year to year and immigrants are evacuated fairly quickly by the U.S. Coast Guard.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends (e.g., increasing, decreasing, stable), demographic features, or demographic trends:

The Monito gecko is a small lizard (36 millimeters (1.42 inches) snout-vent length (SVL)) with an overall pale tan body and dark-brown mottling on the upper surface (cover photo). It is closely

related to the *Sphaerodactylus macrolepis* complex of the Puerto Rican Bank, but variation in dorsal pattern and scale counts confirm the distinctiveness of the species; probably resulting from a single invasion to Monito Island and its subsequent isolation.

Not much is known about the biology of this species, including its diet and foraging behavior. The remoteness and difficulty of access to Monito Island (Figure 1) make studying the Monito gecko difficult (Dodd 1985).

Since the description of the Monito gecko (Schwartz 1977), several surveys of variable length and area covered have been conducted (Table 1). All of these surveys were conducted during the day, when the Monito gecko seems to be less active and hiding under different substrates. The Service had suspected the Monito gecko is more active at night and thus easier to detect during night surveys. This was confirmed during a 2014 rapid assessment and a 2016 systematic survey.

Table 1. Accounts of Monito gecko surveys from 1982 to 1993.

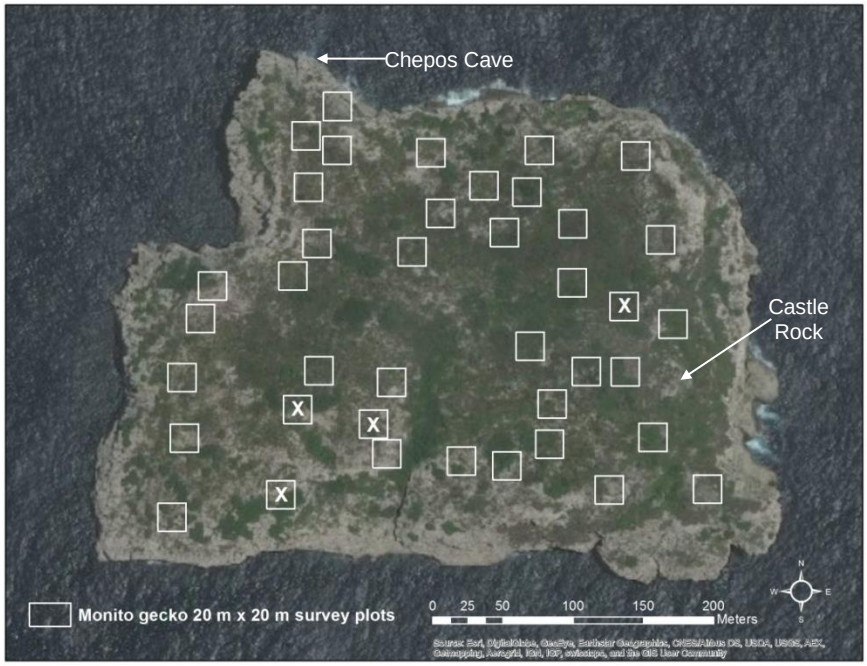
DATE	RESULTS (# geckos)	REFERENCE
August 24-25, 1982	18	Dodd and Ortiz 1983
May 1-2-3, 1984	4	Hammerson 1984
1988	0	PRDNER (unpublished report)
September 1992	4	
October 1992	3	
February 1993	13	
July 1993	0	

During the expedition conducted in May 2014, at least one gecko was seen during each of the three nights of the trip, some were opportunistic encounters and others while actively searching for the species. All observations were made after nightfall and none were seen during daylight hours. On May 5, 2014, the team tried to detect geckos while walking back from Castle Rock to Chepos Cave along the snap trap transect (Figure 2). Effort took approximately 30 minutes and six geckos were observed during that night: three geckos near trap site #9, two near trap site #3, and one inside Chepos Cave (Figure 2). On May 7, 2014, in addition to repeating the previous effort, an intensive search for geckos within the area of Castle Rock (Figure 2) was completed (approximately 40 minutes). Than night 23 geckos were counted: 19 in Castle Rock, two near trap site #9, and another two within Chepos Cave surroundings (Figure 2). Measurements were taken from eight of the individuals captured in Castle Rock (Appendix I).

A systematic gecko survey was conducted in May 2016. Forty (40) random plots were setup on Monito Island (Figure 3). Each plot was 20 m x 20 m (400 m^2), thus survey covered a total of 16,000 m^2 or approximately 11% of Monito Island. Four two-person teams visited 10 plots each. Each observer surveyed each plot independently. A total of 84 geckos were observed during 92 surveys among the 40 plots. All sites were surveyed at least twice and all took place during the night.

Gecko occupancy and abundance was estimated by Angeli (2016) using a standard mathematical population model accounting for the abundance and detection bias that allow individuals to go unseen during surveys. Occupancy of the geckos on Monito Island was 27.8 % (11.3 – 68.6 %). The estimated number of geckos per plot from the best fit model was 73.3 geckos (Range: 1 – 101). The abundance model indicates a total of 1,112 geckos present within the surveyed plots (95% CI: 362 – 2,281). Interpolated across the entire island, Monito Island hosts approximately 7,661 geckos (50% CI: 5,344 – 10,590). The interpolated zones represent the approximate number of geckos at any randomly selected 30 m^2 area (Angeli 2016). Even though the species detections was low (1-8%), the Monito gecko abundance across Monito Island was estimated in the thousands, indicating a large healthy population (Angeli 2016).

Figure 3. Monito gecko random survey plots (X marks plots where geckos were not detected, only 4 out of 40 plots).



Opportunistic encounters of the gecko were also recorded outside of the survey plots. During the first night in Monito Island (May 5, 2016), one observer counted four geckos inside Chepos Cave (Figure 3). On the first plot sampling night (May 6, 2016), seven (7) geckos were observed outside of the plots while walking from one plot to another. On the night of May 7, 2016, while searching for geckos to take photos in Castle Rock, a total of 11 adult geckos were counted in Castle Rock (Figure 3). On the night of May 8, 2016, a total of eight (8) geckos were counted (6 adults and 2 juveniles) within another rocky outcrop next to trap site #9 (Figure 2). This is the same area were another endemic lizard was observed: an adult skink (*S. monitae*) active during the night. Neither of these opportunistic encounters with the gecko was included in the abundance analysis.

It can be argued that if black rat predation on the Monito gecko was the driver for its apparent significant decline and endangered status, then the Monito gecko population numbers before rat invasion (unknown) must have been such that allowed for long-term persistence in the face of rat predation. Thus, the Monito gecko appears to have highly resilient population attributes (e.g. habitat generalist, potential high survival rate) that allow at least some degree of disturbance within a harsh xeric environment.

b. Genetics, genetic variation, or trends in genetic variation:

No new information exists on genetics for this species.

c. Taxonomic classification or changes in nomenclature:

The Monito gecko was originally described by Schwartz (1977) as a distinct species that was difficult to be allied to any other geographically-proximate species of *Sphaerodactylus*, including *S. monensis* residing only about 5 km (3.12 mi) away on Mona Island. Unlike *S. monensis, S. micropithecus* seems most closely allied to the *S. macrolepis* complex on Puerto Rico than the *S. difficilis* complex on Hispaniola (Schwartz 1977; Dodd and Ortiz 1984).

d. Spatial distribution, trends in spatial distribution, or historical range (e.g. corrections to the historical range, change in distribution of the species' within its historical range, etc.):

The Monito gecko is restricted to the island of Monito (Figure 1), an isolated island located in the Mona Passage, about 68 km (42.3 mi) west of Puerto Rico, 60 km (37.3 mi) east of Hispaniola and

about 5 km (3.1 mi) northwest of Mona Island (USFWS 1986). Monito Island is basically a flat plateau surrounded by vertical cliffs rising about 66 m (217 ft) with no beach, and considered the most inaccessible island within the Puerto Rican archipelago (García et al. 2002). With an approximate area of 40 acres (c.a. 16 hectares) (Woodbury et al. 1977), Monito Island is currently part of the Mona Island Reserve, managed for conservation by the PRDNER.

Monito geckos have traditionally been observed in the northwest (Chepos Cave) and in the southeast (Castle Rock) (Figure 2). When the Recovery Plan of the species was approved, the Monito gecko had been reported from three locations within the Island: northeast, southwest, and central (USFWS 1986). However, PRDNER (unpublished. report) reported finding geckos from Chepos Cave to Castle Rock in previously unreported localities, confirming that the gecko is more widely distributed on the Island than previously thought (PRDNER, unpubl. report, Hammerson 1984).

During the May 2014 visit, geckos were observed in the traditional areas of Castle Rock and Chepos Cave (inside and within caves surroundings), and new areas near trap #9 and #3 (Figure 2). During the May 2016 visit, geckos were observed in 36 out of the 40 plots (Figure 3) randomly distributed throughout the Island. Based on the May 2016 data analysis (Angeli 2016), the Monito gecko is distributed across at least one quarter of the Island with a calculated occupancy of 27.8 % (11.3 – 68.6 %) (Angeli 2016). These findings confirm that the Monito gecko is well represented within the Island.

e. Habitat or ecosystem conditions:

The Monito gecko has been found in areas characterized by loose rock sheets or small piles of rocks, exposed to the sun, and with little or no vegetation cover. Vegetation may or may not be associated to these areas. The only life zone present on Monito Island is subtropical dry forest (Ewel and Whitmore 1973). Being a small, ground-dwelling lizard, the Monito gecko, like other members of its genus, is usually found under rocks, logs, leaf litter, and trash (Rivero 1978). In Monito Island, such areas include small groves of *Guapira discolor* (barrehorno), *Pithecellobium unguis-cati* (escambrón colorado), or *Capparis flexuosa* (palo de burro) where some leaf litter is present; island-round regions with loose rocks on the ground; or where piles of rock sheets that

provide shady refuges, and numerous regions where large pieces of metal (remnant ordnance) lay on the ground (Ortiz 1982).

During the May 2014 visit, all geckos detected during the night were seen on exposed substrates and not hidden under rocks or litter. Those detected within Chepos Cave surroundings, were seen within leaf litter mixed with rocks under a *Ficus citrifolia* tree. Geckos were observed escaping into the cracks and solution holes of the limestone rock. During the May 2016 nocturnal plot survey, most of the geckos were found on exposed rock and only eight (8) out of the 84 counted, were found under a rock or other debris; all others were out and about during the night. Only two geckos were opportunistically found during the day while turning rocks and dry logs.

An interesting observation is that one can still notice the pieces of metal that are leftover from the bombing and gunnery exercises by the Air Corps/U.S. Air Force. In July of 1961, the Puerto Rico Bombing Range was declared surplus, and in September 1965, Monito Island was returned to the Commonwealth of Puerto Rico (Parson 2009 *in* USACOE 2009).

f. Other relevant information:

Dodd and Ortiz (1983) suggested the following information on reproduction. Of the 18 individuals counted during their survey, they found juveniles and gravid females suggesting that the species is reproducing well. Dodd and Ortiz (1983) suspected reproduction occurs from at least March through November as suggested by the egg found by Campbell in May 1974, the gravid females found by Dodd and Ortiz (1982) on August 1982, and the fact that *Sphaerodactylus* eggs take 2-3 months to hatch (Rivero 1998). During May 7, 2016, two gravid females were found during the plot survey.

2. Five-Factor Analysis

a. Present or threatened destruction, modification or curtailment of its habitat or range:

Monito Island continues to be managed by the PRDNER for conservation as part of the Mona Island Reserve (Morales 1985). Monito Island was used by the Air Corps/U.S. Air Force as a high-level radar bombing and gunnery range. The entire island was used as a target from 1940 until 1965, when it was declared surplus and returned to the Commonwealth of Puerto Rico (Parson 2009 *in*

USACE 2009). The Monito gecko listing final rule (47 FR 46091) mentioned that, while Monito Island had been used in the past as a target for bombing practices and there were no plans to continue such practices at the time, any major alteration of Monito Island could be detrimental to the continued survival of the Monito gecko. In fact, the large amount of scattered debris on Monito Island suggests significant habitat destruction and modification from bombing activities (USFWS 1986). However, information regarding historical effects of military operations on the species is not available. Assuming all past bombing activities occurred during the day, available information suggests the Monito gecko is mostly under shelter during the day. This behavior may have helped minimize direct bombing effects on the individuals.

A Monito Island site inspection was conducted on August 2009 (PARSONS 2010). A qualitative reconnaissance and munitions constituents (MC) sampling was performed to confirm the range location and to evaluate the potential presence of munitions and explosives of concern (PARSONS 2010). Although, unexploded ordnance (UXO) and munitions debris was found on Monito Island, immediate munitions removal actions were not warranted at that time and further sampling may be needed.

The potential future UXO detonation activities may have an effect on the Monito gecko and its habitat. Since Monito Island is a natural reserve, all activities must be coordinated with PRDNER. In addition, any action will need consultation with the Service, and the implementation of site-specific conservation measures will be required to avoid and minimize potential adverse effects. The Service is currently evaluating the July 2016 Draft Final Standard Operating Procedures for Protected Species developed by the Corps of Engineers. Based on these consultation requirements, the magnitude of threat of these future Corps of Engineers actions on the Monito gecko would be low and non-imminent. Other non-intrusive UXO cleanup activities should be implemented.

Monito Island receives immigrants usually from the western islands of Cuba and Hispaniola while trying to enter U.S. territory. The PRDNER had mentioned that immigrants sometimes light fires on Monito in order to be detected and rescued. This information was documented during the May 2016 trip, where 2 recent fire pits were found. These were found on the south-southeast side of Monito Island close to the edge of the island on exposed rock. A small pile of fire wood cuttings was also found.

The presence of fire pits on Monito Island had not been documented in the past. At least for the two fire pits found in May 2016, their placement and construction demonstrates these were controlled fires and their intention was not of criminal nature. There is no information available on the frequency and damage these fires may be causing. According to what was documented in May 2016, fires are small, controlled and placed on exposed rock with little to no vegetation in the immediate vicinity. If these are the usual characteristics of these fires, their potential effects may also be considered low.

We do not have any specific information regarding how these potential habitat modifications may have affected the species in the past or if they are currently affecting the species. Based on the above and the fact that Monito Island has been a Reserve managed for conservation since 1985, the destruction, modification, or curtailment of habitat should not be considered a current threat to the Monito gecko. In addition, the May 2016 survey demonstrates the species is distributed throughout the Island despite these low and infrequent potential habitat modifications.

b. Overutilization for commercial, recreational, scientific, or educational purposes:

The final rule (47 FR 46091) mentioned that the rarity of the Monito gecko indicates that removal of specimens could be detrimental. At present, we are not aware of any individuals taken after listing (1982) for commercial, recreational, scientific or educational purposes. The remoteness and difficult access of Monito Island further limits any collecting efforts. In addition, access is only allowed under special permits issued by the PRDNER, mostly for research, security or management purposes. Therefore, based on existing information, this factor is not considered a current threat to the Monito gecko.

c. Disease or predation:

Disease or parasitism has not been reported to be a threat to the Monito gecko.

The final rule (47 FR 46091) indicates that the presence of large numbers of introduced black rats was thought to be the major factor in the precarious state of the Monito gecko because, although predation by black rats on this species has not been confirmed, rats are predaceous and are known to feed on both lizards and lizard eggs (Dodd and Ortiz 1983). Thus, predation of

rats was considered a possible cause of population decline for the Monito gecko (USFWS 1986).

Ortiz (1982) believed that rats on Monito Island were facultative with respect to their diets; with a preference for any one particular food item unlikely, as year round availability of a given item might be limiting. He further stated that Monito geckos may not be important food items for rats because of the geckos' extreme rarity (Ortiz 1982). However, he indicated that potential predators of Monito geckos such as rats must be studied intensively to determine whether they did represent a threat to the species (Ortiz 1982). Dodd and Ortiz (1983) explain that predator pressure on the gecko could not be proven from their survey trip and that potential predators such as rats, must be studied to determine whether they do threaten the species.

There is also no information available on the potential effect of rats on the Mona gecko (*Sphaerodactylus monensis*) or the Desecheo gecko (*Sphaerodactylus levinsi*), both relatively common species on the larger Mona Island and Desecheo Island. However, the potential effect of rats, cats, pigs, and goats on the Mona gecko seem to be low or not significant, same as for rats on the Desecheo gecko.

Rats have never been documented preying upon geckos on Monito or Mona Island (or mainland Puerto Rico), but they have been responsible for the extinction or extirpation of several species of reptiles, birds, and invertebrates in other parts of the world (García et al. 2002). Although evidence of geckos killed by rats has not been documented, this may be an artifact of the feeding behavior of rats where they macerate their food items, making it difficult to identify traces of its diet within rat stomach content samples, though this was never done in Monito. However, as explained in section II.B.3. of this 5-year review, the most current information indicates there are no black rats on Monito Island.

After the completion of a rat eradication campaign in 1999, García et al. (2002) did not detect the presence of rats on Monito Island. Other trips to the island mainly for seabird research also did not detect rats on August 2000 (Anderson and Steeves 2000), and on 2003 by the PRDNER. The Service and the PRDNER May 2014 and 2016 trips also did not detect any rats, even with the use of chew blocks as recommended by García et al. (2002). Thus the main threat to the Monito gecko has not been present for more than 10 years. In addition, there is no evidence that rat predation was an operating threat to the gecko. The Monito gecko's apparent

rarity may have been an artifact of sampling bias, as surveys from 1982 to 1993 were done during daylight hours when the species is mostly hiding.

Ortiz (1982) included the native skink *Spondilurus monitae* (formerly *Mabuya mabouya sloani*) as a potential predator of the Monito gecko. Other species of *Mabuya* feed primarily on small invertebrates, but the diversity of prey types in stomach contents, including small vertebrates, indicates that some skink species such as *M. bistriata* most likely feed on any moving animal of the appropriate size (Vitt and Blackburn 1991). Rivero (1998) states that *M. mabouya* live in places where *Sphaerodactylus* abound, and it is not improbable that geckos constitute an important food item for that species. In fact, during the 2016 trip, biologist did observe one adult skink active during the night occurring within the same exposed rock habitat used by the Monito gecko (i.e., exposed karst rock with lots of crevices and holes). It is also highly probable, that another native lizard, *Anolis monensis*, will prey on the Monito gecko as well, but *Anolis* are considered diurnal.

During our site visit in May 2014, 2 out of the 8 geckos captured for measurements were missing the tips of their tails, and during May 2016, only 5 geckos out of the 84 seen had missing tail parts. This suggests that a low natural predation pressure probably occurs from the two other native lizard species mentioned above. Based on observations from the 2014 and 2016 trip, *A. monensis* is abundant throughout the Island, but active mostly during the day. Besides thermoregulatory adaptations, the Monito gecko's nighttime activity may have been a trait that developed in order to avoid and reduce diurnal predation, especially from the abundant *Anolis* population on the Island.

Based on the information above, predation by rats is not a current threat to the Monito gecko. Natural predation by other native lizards may be considered a low threat to the species. The species has persisted despite potential predatory threats and there is no indication that the magnitude of an undetermined natural predation pressure is critical to the gecko's recovery or listing status (see Pages 5-6, Recovery action 3 paragraphs).

d. Inadequacy of existing regulatory mechanisms:

At present, Federal and local laws and regulations protect the Monito gecko. The Monito gecko was protected under the Endangered Species Act of 1973, as amended, in 1982. In 1999,

the Commonwealth of Puerto Rico approved the Law No. 241 known as the New Wildlife Law of Puerto Rico (*Nueva Ley de Vida Silvestre de Puerto Rico*). The purpose of this law is to protect, conserve, and enhance both native and migratory wildlife species; declare property of Puerto Rico all wildlife species within its jurisdiction, regulate permits, regulate hunting activities; and regulate exotic species, among other actions. In 2004, the PRDNER approved Regulation 6766 - to regulate the management of threatened and endangered species in Puerto Rico (*Reglamento 6766 - Reglamento para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico*). The Monito gecko was included in Regulation 6766 as endangered. Article 2.06 of this regulation prohibits collecting, cutting, removing, among other activities, listed animals within the jurisdiction of Puerto Rico.

Besides laws to protect the Monito gecko, the PRDNER has managed the Monito Island as a natural reserve since 1985, protecting its wildlife and vegetation. Monito Island is managed for conservation since it harbors one of the largest seabird nesting colonies in the Caribbean, in addition to other endemic and federally listed species like the gecko, the Higo chumbo cactus and the Yellow-shouldered blackbird. There are no permanent residents on the Island and public access is prohibited.

In addition, any action or project with Federal nexus (e.g., Federal funds, permits, or actions) would require a consultation with the Service under Section 7 of the ESA. During the consultation process, conservation measures to minimize possible effects of action or projects are identified.

Based on the above, the inadequacy of existing regulatory mechanisms is not a current threat to the Monito gecko. Commonwealth laws and regulations protect the Monito gecko, and there is no evidence supporting lack of enforcement of regulations to protect this species or governmental measures to prevent destruction of its critical habitat.

e. Other natural or manmade factors affecting its continued existence:

At the time of listing, other natural or manmade factors were not identified as threats to the Monito gecko. Potential sea level rise as a result of climate change should not be a threat to this species or its critical habitat, because the Monito gecko is only found on

Monito Island which is 66 m (217 ft) above sea level and has no beach areas.

An extremely small population size was another of the factors considered towards the species listing status (47 FR 46090). However, there are several arguments to consider. As previously explained in section II.B.3., the Monito gecko is a small and cryptic species and seems to be more active at night. Most of the past surveys documented in this review (Table 1) were done during daylight hours, when the species is apparently less active, safely hiding from diurnal native reptile predators, and/or exhibiting behavioral adaptations to avoid the hot temperatures within its xeric dry forest environment.

These characteristics may influence population surveys of the Monito gecko if methods are not adjusted accordingly. For example, diurnal vs. nocturnal surveys, that may provide for differences in estimates and detection probabilities. Detection and effort may also be problematic because of the small size and cryptic nature of the species. Surveys within different microhabitats may also be biased. For example, a quick survey of the Mona gecko, *S. monensis*, showed significant differences of the species, being more abundant and dense under closed canopy forest (unpublished data, Ramírez-Gallego and Barrientos-Muñoz 2010). In fact, M. García (PRDNER, unpublished report) specifies on the difficulties of census techniques for population estimates for this species, including uncontrolled variables such as researcher expertise and/or commitment, weather, and season.

The best available population estimate for the species was completed during the May 2016 trip to Monito Island. Results show that the Monito gecko is widely distributed throughout the island and gecko abundance appears to number in the thousands, indicating a large healthy population (Angeli 2016).

Although Monito Island is currently rat free, there is still the possibility that rats could reach the island again. Rats may be transferred from Mona Island by floating debris or more likely by human means. Monito Island receives immigrants mostly from Cuba, Haiti and Dominican Republic while trying to enter U.S. territory. To a lesser degree and probably uncommon, there is limited evidence of the general public disembarking on Monito for recreational or unknown purposes. Although it is logistically difficult to disembark on the island and it is not permitted because of unexploded ordinances from the previous military activities, these disembarking events may increase the chance of invasion and

establishment of rats or other exotics species. However, this possibility is considered very low. The rat eradication campaign was completed in 1999, and 16 years later, no rats have been found. Although rat reinvasion seems unlikely, it cannot be disregarded.

Based on the above, other natural or manmade factors are not considered a current threat to the Monito gecko.

D. Synthesis

The Monito gecko is a species restricted to the island of Monito, a small island off the west coast of Puerto Rico. It was listed as an endangered in 1982 (47 FR 46090) because of its apparent small population size coupled with suspected predation by black rats. In addition, the entire island of Monito was declared critical habitat for this species. The remoteness and difficulty of access to Monito Island make studying the Monito gecko extremely difficult (Dodd 1985). Not much is known about the biology of this species, including its diet and foraging behavior.

Factors believed to be responsible for the apparent rarity of the Monito gecko are rat predation, habitat alteration by U.S. Air Force aerial bombing practices on Monito Island after World War II, survey sampling design and difficulty of finding the species. Monito Island has been rat free for more than 10 years after the completion of a second rat eradication campaign in August 1999. Recent rat surveys conducted in May 2014 and 2016 confirmed the absence of rats on Monito Island. The Monito gecko may still potentially have some natural predation pressure from other native lizards on the island. However, the species has persisted despite potential predatory threats and there is no indication that the magnitude of an undetermined natural predation pressure is critical to the gecko's recovery or listing status.

The May 2014 assessment and May 2016 systematic gecko survey encountered the highest number of geckos ever counted for the species. The May 2016 survey showed that the Monito gecko is abundant across the Island and appears to number in the thousands, indicating a large healthy population. Although there are no historical systematic surveys to determine population trends, the species has demonstrated resilient attributes (e.g. habitat generalist, potential high survival rate) for long-term persistence in the face of disturbance (i.e., past apparent rat predation and bombing effects). The principal threat to the species (i.e., suspected predation by black rats) was eliminated more than 10 years ago. Other potential future impacts to the species and its habitat (i.e., USACOE UXO inspection and cleanup activities, and immigrants and public disembarking on the island) are considered low and non-imminent. Thus, are not considered current threats to the species. Moreover, Monito Island is part of the Mona Island Reserve, managed for conservation by the PRDNER. Therefore, we believe the

species no longer meets the definition of an endangered or threatened species due to lack of threats and should be considered for delisting.

III. RESULTS

A. Recommended Classification:

__X__ Delisting. Based on the best available information provided in this review, we believe the species no longer meets the definition of an endangered or threatened species.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Based on the information available, we recommend the following actions:

- Prepare a proposed delisting rule for consideration in fiscal year 2017.
- Prepare a draft post-delisting monitoring plan that includes rat presence/absence surveys and repeat the 2016 survey to compare abundances over time and further ensure the species no longer requires ESA protection.
- If rats are detected in the near future, initiate a rat eradication campaign in cooperation with the PRDNER and/or other partners.
- Develop conservation measures to minimize or prevent mortality of Monito geckos, and critical habitat modification or destruction, from potential UXO removal, through close coordination and consultation with the appropriate Federal and Commonwealth agencies. These measures could be continued if this species is delisted as part of post delisting monitoring efforts with partners.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Monito gecko / *Sphaerodactylus micropithecus*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

_____ Downlist to Threatened
_____ Uplist to Endangered
__X__ Delist
_____ No change is needed

Review Conducted By: Jan P. Zegarra, Caribbean Ecological Services Field Office and Jorge Saliva.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve _____ Date 8/1/2016

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Acting Approve _____ Date 8/8/16

APPENDIX I: Morphometric measurements of Monito geckos captured and released on the night of May 7, 2014.

Individual	SVL (mm)	Tail length (mm)	Total length (mm)
1	27	20	47
2	15	17	32
3	35	35	70
4	13	14	27
5	33	32	65
6	18	11*	29
7	22	25	47
8	18	7*	25

*Missing tail tip.