

## **5-YEAR REVIEW**

Short Form Summary

**Species Reviewed:** *Corvus kubaryi* (Mariana crow; aga)

**Current Classification:** Endangered

### **Federal Register Notice announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and Threatened Wildlife and Plants; 5-Year Status Reviews of 46 Species in Idaho, Oregon, Washington, Nevada, Montana, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 77:13248- 13251.

### **Lead Region/Field Office:**

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

### **Name of Reviewer:**

Julia Boland, Wildlife Biologist, PIFWO

### **Methodology used to complete this 5-year review:**

This review was conducted by staff of PIFWO, U.S. Fish and Wildlife Service (USFWS). The review was based on current, available information since the last 5-year review for the Mariana crow (USFWS 2009). The evaluation by Julia Boland, Fish and Wildlife Biologist, was reviewed by Acting Recovery Program Lead. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

### **Background:**

For information regarding the species listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species ([http://ecos.fws.gov/tess\\_public](http://ecos.fws.gov/tess_public)).

### **Review Analysis:**

Please refer to the final listing rule for the Mariana crow published on August 27, 1984 (available at [http://ecos.fws.gov/docs/federal\\_register/fr875.pdf](http://ecos.fws.gov/docs/federal_register/fr875.pdf)), the previous 5-year review published on August 25, 2009 (available at [http://ecos.fws.gov/docs/five\\_year\\_review/doc2613.pdf](http://ecos.fws.gov/docs/five_year_review/doc2613.pdf)) and the draft revised recovery plan published in May 2005 (available at [http://ecos.fws.gov/docs/recovery\\_plan/060111.pdf](http://ecos.fws.gov/docs/recovery_plan/060111.pdf)) for a complete discussion of the species' status (including biology and habitat), threats, and management efforts. No significant new information regarding the biological status has come to light since listing to warrant a change in the federal listing status of the Mariana crow.

### **New status information:**

The Mariana crow population continued to decline on Guam from about 10 individuals in 2006, to three individuals in 2008, to one male in 2011 (SWCA 2012). The Mariana crow is now extirpated from Guam. The last known Mariana crow of Guam origin was observed in 2001, and the last known wild Mariana crow that was captive-reared from

Rota and released on Guam was observed in 2012 (J. Quitugua, Guam Division of Aquatic and Wildlife Resources, pers. comm. 2014).

The Mariana crow population on Rota has also continued to decline. The most recent island-wide pair survey on Rota was conducted during the 2013 breeding season and documented 46 breeding pairs (Table 1). During the 2013 breeding season, 16 of the 46 pairs (35%) successfully fledged young (Kroner and Ha 2014). The estimated pair breeding success rate for 2013 was down from 60% in 2008 (Zarones *et al.* in press) and 57% in 2012 (Ha *et al.* 2013).

Analyses of Mariana crow re-sight data from 1990-2010 suggested that the first-year survival rate fell from 0.8 to 0.4; a 300% increase in first-year mortality (Ha *et al.* 2010). However, recent analyses suggest that first-year survival has increased to 0.65 since 2010 (R. Ha, University of Washington, pers. comm. 2014). Results of the same analyses on adults suggest that adult survival has remained steady at about 0.8 (Ha *et al.* 2010).

**Table 1.** Summary of population estimates for the Mariana crow on Rota, adapted from Table 1 of the draft revised recovery plan (USFWS 2005).

Year	Population estimate	Unit	Survey Method	Source
1982	1,318	Individuals	Off-road VCP <sup>1</sup>	Engbring <i>et al.</i> 1986, as cited in USFWS 2005
1992	447-931	Individuals	Roadside VCP	M. Lusk, DFW, 1995 (unpubl. data) , as cited in USFWS 2005
1993	336-454	Individuals	Roadside VCP	M. Lusk, DFW, 1995 (unpubl. data) , as cited in USFWS 2005
1995	592	Individuals	Off-road VCP	Fancy <i>et al.</i> 1999, as cited in USFWS 2005
1995	365-607	Individuals	Off-road VCP	R. Camp, USGS, 2001 (unpubl. data) , as cited in USFWS 2005
1998	138-504	Individuals	Off-road VCP	R. Camp, USGS, 2001 (unpubl. data) , as cited in USFWS 2005
1999	234	Breeding adults	Extrapolated from known pairs and density estimates	Plentovich <i>et al.</i> 200, as cited in USFWS 20055
2004	170 <sup>2</sup>	Breeding adults	Off-road VCP	Amar <i>et al.</i> 2008, as cited in USFWS 2009
2008	50-60	Breeding pairs	Island-wide pair survey	Zarones <i>et al.</i> in press
2013	46	Breeding pairs	Island-wide pair survey	Kroner and Ha 2014

<sup>1</sup>Variable Circular Plot (VCP) survey methodology

<sup>2</sup> Magnitude of observed decline applied to most recent population estimate

New threats:

- Cat predation – Mariana crow telemetry studies were conducted from 2009-2013 and will begin again in the 2014-2015 nesting season. Before telemetry studies began on Rota there was no evidence available to suggest feral cats (*Felis silvestris*) were preying on crows. The lack of evidence was likely due to high scavenging and decomposition rates, and the extreme unlikelihood of finding a fresh carcass in time to retrieve any useful information regarding cause of death. Since telemetry efforts began, nine recently-deceased, radio-tagged Mariana crows have been found with evidence suggesting cat predation, and one untagged juvenile was taken in for care and later died after receiving what a veterinarian confirmed as an infected cat bite (Ha *et al.* 2010, 2012, 2011, 2013).

In addition to cat predation, additional threats not specifically addressed in the 2009 5-year review continue to be:

- Agricultural and urban development loss or degradation of habitat – Loss and/or degradation of habitat through military training activities and human development on Guam, and human development on Rota.
- Human disturbance – Although there has not been any direct evidence of illegal hunting of Mariana crows since 1995 (D. Grout testimony, as cited in NRC 1997), informal testimony from Rota community members suggests that opportunistic killing of crows still occurs.
- Nonnative snake predation – brown treesnake on Guam.
- Stochastic events - Hurricane mortality and reduced viability
- Stochastic events – Reduced viability due to low numbers.

New management actions:

- Population viability monitoring and analysis
  - Banding: The University of Washington's Rota Avian Behavioral Ecology Program (RABEP) has banded 80 Mariana crows since 2005 (Ha *et al.* 2013; Kroner and Ha 2014). Re-sight data has been used to develop age-specific survivorship models (see "New status information" above).
  - Nest monitoring: RABEP have conducted nest monitoring for the Mariana crow on Rota since 2005. Efforts provide data that is used for analyses of nesting success and demographics (see "New status information" above).
  - Mariana crow mortality monitoring: From 2009 to 2013, transmitters were attached by RABEP to 32 Mariana crows that were tracked and monitored for the life of the battery (n=14), until death of the bird (n=12), loss of the signal (n=1), or until the harness was removed (n=5) (Ha *et al.* 2013). In all but one case the outcome was determined by either locating the carcass or re-sighting the live bird after battery failure. Nine radio-tagged birds died from suspected cat predation, two died of unknown causes, and a tagged fledgling died from complications with the radio harness. Due to the possibility of elevated risks of radio-tag use on

juveniles, all transmitters were removed from currently tagged juveniles and additional juveniles will not be tagged until alternative, lower-risk methods are identified.

- Habitat and natural process management and restoration – The Mariana Crow Conservation Area (MCCA) was established on Rota through an MOA between the Commonwealth of the Northern Mariana Islands (CNMI) and PIFWO (USFWS 2011). The CNMI, through the Department of Public Lands (DPL), released approximately 244 agricultural homesteads on Rota, a project that resulted in: (1) transfer of approximately 246 hectares (608 acres) of public lands to private ownership; and (2) construction of right-of-way roads on an additional 32 hectares (79 acres). DPL, the CNMI Department of Lands and Natural Resources (DLNR), and the Municipality of Rota (MOR) collaborated with PIFWO to develop and implement extensive conservation measures to avoid and minimize incidental take of the Mariana crow, and agreed to protect and manage in perpetuity 444 hectares (1,097 acres) of land on Rota as the MCCA. This area encompasses foraging and nesting habitat and contains active Mariana crow territories. The resolution of this nearly 20-year landowner conflict is anticipated to alleviate some of the public animosity toward conservation of the crow.
- Human interaction monitoring and management / Conservation finance / Alliance and partnership development – The Mariana Crow Incentive Plan (2012-2014) is a joint endeavor between the USFWS, The Mariana Islands Nature Alliance (MINA), RABEP, the CNMI Department of Fish and Wildlife (DFW), and the MOR compensated participants on Rota with a monetary award in exchange for protecting occupied crow habitat and allowing access for population monitoring and feral cat control on their land (USFWS 2012). The goal of the plan was to change human perceptions of the Mariana crow and protect valuable habitat.
- Predator / herbivore monitoring and control – The UW Rota Island Feral Cat Removal Project began cat removal efforts on Rota in February 2012 (Ha *et al.* 2013). As of June 2014, the project removed 589 cats from areas in and around crow territories (Leo 2014). The Institute for Wildlife Studies will take over cat control efforts on Rota by December 2014.
- Captive propagation for genetic storage and reintroduction – Captive care of sick or injured crows is conducted on an as-needed basis by RABEP captive care specialists.
- Strategic planning / Threats management planning – USFWS in cooperation with the Mariana Crow Recovery Team conducted an exercise in structured decision making (SDM) to determine which actions should be taken now and over the next several years to maximize the probability of preventing extinction and set the foundation for at least one stable to increasing population in the wild. The two primary objectives driving the SDM were to prevent the extinction of the Mariana crow and to ensure a viable stable or increasing population in the wild. Priority actions identified in the SDM exercise included predator control on Rota, and a phased approach to captive propagation (see details below in “Recommendations for Future Actions”).

## Synthesis:

The Mariana crow population is now extirpated from Guam, and has continued to decline on Rota (Table 1), juvenile mortality increased by 300% between 1990 and 2010 (Ha *et al.* 2010), and none of the criteria for downlisting (USFWS 2005) have fully been met (Table 2). Cat predation was recently identified as a mortality factor, but control efforts have just begun and plans to intensify the effort will begin by the end of 2014. Other unknown factors are suspected to contribute to Mariana crow mortality, but intensive monitoring and management actions are required to identify and control those threats. Therefore, the Mariana crow still meets the definition of endangered as it remains in danger of extinction.

**Recommendations for Future Actions:**

Recovery implementation for the Mariana crow should include the following:

- Implement priority actions identified in the Mariana crow SDM exercise:
  - Predator / herbivore monitoring and control – Predator control on Rota with an initial emphasis on feral cats and an adaptive approach that will include additional predators should information become available that other species are posing a threat to crows.
  - Captive propagation for genetic storage and reintroduction – The phased approach to captive propagation will begin with rear and release; retrieving eggs and/or chicks from the wild population, hand-rearing until birds are passed the age of highest mortality risk, and releasing birds back to the wild on Rota. Future efforts may use founder birds from rear and release program for more intensive efforts in captive propagation.
- Population viability monitoring and analysis
  - Continue field research to identify sources of adult and juvenile mortality and implement appropriate management measures to increase adult and juvenile survival.
  - Continue population and demographic monitoring on Rota.
- Habitat and natural process management and restoration – Set aside and protect recovery areas for Mariana crow on Guam.
- Predator / herbivore monitoring and control – Continue support of efforts to reduce brown treesnake populations over large areas of Guam, and interdiction efforts on Rota.

**Table 2.** Status and trends of the Mariana crow from listing through current 5-year review.

Date	Estimated Number (Guam/ Rota)	Downlisting Criteria Identified in Recovery Plan	Downlisting Criteria Completed?
1984 (listing)	150-200 individuals/ 1300 individuals	Populations of a minimum of 75 pairs occur on Rota and Guam	No
		Both populations are stable or increasing	No

		Sufficient habitat is protected and managed	No
		Brown treesnakes and other predators that threaten Mariana crow are controlled	No
		Brown treesnake interdiction effective on Rota	No
		Efforts to resolve landowner conflicts have been implemented	No
2004 (critical habitat); 2005 (draft revised recovery plan)	Insufficient data/ 170 breeding adults	Populations of a minimum of 75 pairs occur on Rota and Guam	No
		Both populations are stable or increasing	No
		Sufficient habitat is protected and managed	No
		Brown treesnakes and other predators that threaten Mariana crow are controlled	No
		Brown treesnake interdiction effective on Rota	No
		Efforts to resolve landowner conflicts have been implemented	No
2009 (5-year review)	2 individuals/ 120 breeding adults	Populations of a minimum of 75 pairs occur on Rota and Guam	No
		Both populations are stable or increasing	No
		Sufficient habitat is protected and managed	No
		Brown treesnakes and other predators that threaten Mariana crow are controlled	No
		Brown treesnake interdiction effective on Rota	No
		Efforts to resolve landowner conflicts have been implemented	No

2014 (5-year review)	Insufficient data/ 92 breeding adults	Populations of a minimum of 75 pairs occur on Rota and Guam	No
		Both populations are stable or increasing	No
		Sufficient habitat is protected and managed	Partially; 444 hectares of crow habitat set aside in conservation on Rota
		Brown treesnakes and other predators that threaten Mariana crow are controlled	Partially; some control efforts on Guam
		Brown treesnake interdiction effective on Rota	Partially; limited interdiction efforts now in place on Rota
		Efforts to resolve landowner conflicts have been implemented	Partially; Homestead MOA (USFWS 2011) resolved a longstanding landowner conflict; Incentive Plan implemented from 2012-2014 (USFWS 2012)

**Table 3. Threats to the Mariana crow and ongoing conservation efforts**

<b>Threat</b>	<b>Listing Factor</b>	<b>Current Status</b>	<b>Conservation/ Management Efforts</b>
Habitat loss or degradation	A	ongoing	Partially; 444 hectares of crow habitat set aside in conservation on Rota
Introduced predators	C	ongoing	Partially; cat control began in 2012
Human persecution	E	insufficient data	Partially; landowner conflicts being addressed through Rota Homestead MOA, Rota Landowner Incentive Plan, and pursuit of the Rota Island-wide Conservation MOA. Education programs and public perception survey conducted by RABEP 2009-2013.
Typhoons	E	ongoing	No
Reproductive and small population problems	E	ongoing	No
Disease	C	insufficient data	No

Nutritional deficiencies	E	insufficient data	No
Contaminants	E	insufficient data	No
Harassment by black drongos	E	insufficient data	No
Competition with introduced species	E	insufficient data	No

**References:**

See previous 5-year review for a full list of references. References for new information are provided below.

Ha, R. R., J. C. Ha, and S. Faegre. 2010. Annual report (August 1, 2009 – August 30, 2010) on the Mariana crow (*Corvus kubaryi*) and the Rota White-eye (*Zosterops rotensis*) on the Pacific island of Rota. University of Washington, Seattle, Washington. 68 pages.

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Ha, R. R., J. C. Ha., and S. Faegre. 2013. Annual report (October 1, 2012 – August 31, 2013) on the Mariana crow (*Corvus kubaryi*). Report to CNMI DFW. University of Washington, Seattle, Washington. 81 pages.

Kroner, A., and R. Ha. 2014. Mariana crow pair estimate report, 2013-2014. Report to USFWS. University of Washington, Seattle, Washington. 13 pages.

Leo, B. 2014. Rota Island feral cat removal project, June 2014. Report to USFWS. University of Washington, Seattle, Washington. 4 pages.

[NRC] National Research Council. 1997. The scientific bases for preservation of the Mariana Crow. National Academy Press, Washington, D.C.

[SWCA] SWCA Environmental Consultants. 2012. Final summary report: noise study and demographic survey of Mariana fruit bats and Mariana crows, Andersen Air Force Base, Guam. Prepared for Joint Region Marianas, Naval Facilities Engineering Command, Marianas and Andersen Air Force Base 36th CES/CEV. Hagatna, Guam. 75pages.

[USFWS] U.S. Fish and Wildlife Service. 2004. Endangered and threatened wildlife and plants; designation of critical habitat for the Mariana fruit bat and Guam

Micronesian kingfisher on Guam and the Mariana crow on Guam and in the Commonwealth of the Northern Mariana Islands. Federal Register 69:62944-62990.

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[USFWS] U.S. Fish and Wildlife Service. 2011. Rota agricultural homesteads Memorandum of agreement between the Commonwealth of the Northern Mariana Islands and Pacific Islands Fish and Wildlife Office, U.S. Fish and Wildlife Service, Honolulu, Hawaii. 30pages. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2012. The Mariana crow landowner incentive plan. U. S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 8 pages.

Zarones, L., A. Sussman, J. M. Morton, S. Plentovich, S. Faegre, C. Aguon, A. Amar, R. R. Ha. In press. Populations status and nest success of the critically endangered Mariana crow (*Corvus kubaryi*) on Rota, Northern Mariana Islands. Bird Conservation International.

### **Personal Communications**

Ha, Renee. 2014. Department of Psychology, Rota Avian Behavioral Ecology Program, University of Washington, Seattle, Washington. E-mail to Julia Boland, U. S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, dated July 10, 2014. Subject: Aga 5-year review.

Quitugua, Jeff. 2014. Guam Division of Aquatic and Wildlife Resources, Mangilao, Guam. E-mail to Julia Boland, U. S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, dated July 17, 2014. Subject: Aga reports for Guam since 2009.

**U.S. FISH AND WILDLIFE SERVICE**  
SIGNATURE PAGE for 5-YEAR REVIEW on  
*Aga (Pteropus mariannus mariannus)*

Pre-1992 DPS listing still considered a listable entity? N/A

Recommendation resulting from the 5-year review:

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Delisting  
 Reclassify from Endangered to Threatened status  
 Reclassify from Threatened to Endangered status  
 No Change in listing status

*for* Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office

*Maria M. Beuaman*

Date 2014-08-12