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THE MARIANA COMMON MOORHEN: DECLINE OF AN ISLAND ENDEMIC[1]

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Abstract. Current status of Mariana Common Moorhens (*Gallinula chloropus guami*) in the Mariana Islands was determined by wetland surveys. A total of 300–400 moorhens exist on Guam, Saipan and Tinian. Extinctions have occurred recently on Pagan and prehistorically on Rota. A review of literature, field notes, and habitat loss indicates the subspecies' total population has probably been reduced by at least 36–52% in this century. The degradation and loss of wetlands and introduced competitors and predators pose the greatest threats to the moorhen in the Marianas.

Key words: Mariana Common Moorhen; Gallinula chloropus guami; *Mariana Islands; status; endangered.*

INTRODUCTION

The Mariana Common Moorhen (*Gallinula chloropus guami*), known locally as "Pulattat," is endemic to the Mariana Archipelago in the western Pacific. This moorhen resembles the Eurasian subspecies (*chloropus, indica,* and *orientalis*) which have a frontal shield with a rounded top, but differs from these slightly in coloration and/or size. *G. c. guami* differs from the Hawaiian endemic, *G. c. sandvicensis,* which has a larger, truncated frontal shield and is probably of New World origin (Hartert 1898, 1917; Baker 1951; Ripley 1977). The Mariana Common Moorhen was historically found on the islands of Guam, Saipan, Tinian, and Pagan (Baker 1951). Recent archaeological excavations have found that it apparently was also once found on Rota (Becker and Butler 1988). The Mariana Common Moorhen was listed as Endangered by the U.S. Fish and Wildlife Service in 1984 (USFWS 1984). They identify habitat loss as the most important factor affecting the Mariana moorhen (USFWS 1988). The Mariana Common Moorhen shared wetland habitats with the Mariana Mallard (*Anas oustaleti*), now believed extinct (Engbring and Pratt 1985; Reichel and Lemke, in prep.). This paper summarizes the historical and present status of moorhens in the Marianas and outlines present threats and prospects for their survival.

METHODS

We surveyed moorhens on Guam, Saipan, Tinian and Pagan (Fig. 1). These islands are of volcanic origin, but the surfaces of Saipan, Tinian, Rota and northern Guam are primarily limestone deposits that have been uplifted.

To determine the historical populations of moorhens and the extent of habitat loss, we examined accounts in the literature and examined field notes of previous researchers in the Marianas, including those from the Guam Division of Aquatic and Wildlife Resources (DAWR) and Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife (CNMI-DFW). DAWR undertook an island-wide wetland/moorhen distribution survey during 1988–1989. Most wetlands were surveyed twice: once during the wet season and again during the dry season (generally, January or February through June). Each wetland was identified as man-made or natural, the vegetation identified and classified as dominant or subordinate, the percent open water approximated and any signs of moorhen recorded. Thirty to 60 min were spent at each wetland surveyed. Surveys at Fena Valley Reservoir were conducted by canoe.

Current population estimates are derived from

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wetland surveys. CNMI-DFW surveys involved visiting wetlands from several minutes to 6 hr and looking and listening. Wetlands were visited from one to 16 times between March 1989 and May 1990 and most were visited both in the dry and rainy seasons. Surveys at Susupe Lake involved circumnavigation of the lake once on foot and four times with an inflatable boat. Moorhen estimates for Susupe Lake and small wetlands are based on the highest number detected during any visit. A planimeter was used in estimating wetland sizes and loss on Saipan. The lakes on Pagan were visited during seven trips from 1983–1990 which totaled 36 man-days. No moorhens or permanent wetlands currently exist on any other Mariana island.

RESULTS AND DISCUSSION

GUAM

Quoy and Gaimard (1824–26, in Baker 1951) first recorded the moorhen on Guam. Kittlitz (1858, in Hartert 1898) reported that moorhens were rare and inhabited "inaccessible reed-thickets." The moorhen's affinity for fresh and brackish water wetlands, fallow rice paddies, and cultivated taro patches has been noted by numerous authors (Hartert 1898, Seale 1901, Baker 1951, Beaty 1967). During the early 1900s, moorhens were an esteemed food and hunting pressure may have resulted in their relative rarity (Seale 1901, Safford 1902, Bryan 1936). During the late 1940s moorhens were considered common to abundant on the island (Marshall 1949, Baker 1951). Baker (1951) found large numbers of birds along the Ylig River and the Agana Swamp. In the 1970s the population was estimated at from less than 100 (Tenorio and Associates 1979) to 150 birds (Drahos 1977). Over the last 15 years, the moorhen population on Guam seems to have been relatively stable. Currently, the population is estimated to be 100–125 birds (DAWR unpubl. data).

We found moorhens using 17 palustrine wetlands and one lacustrine wetland on either a year-round or seasonal basis (Table 1). With the exception of Fena Valley Reservoir (81 ha) and the reed-choked (*Phragmites karka*) Agana Swamp (71 ha), the majority of wetlands inhabited by moorhens were less than 0.6 ha in size. Moorhens make extensive use of man-made wetlands in the form of suburban ponding basins, golf course ponds, and both large and small reservoirs. Fifteen out of 18 wetlands (83%) used by moorhens during the wet season were man-made as were 11 out of 14 (78%) used in the dry season. Wetlands used by moorhens were primarily vegetated with nonpersistent emergents (*Cyperaceae, Gramineae, Panicum muticum*). During this study, 15 out of 34 (43%) of all wetlands surveyed and four out of 18 (22%) wetlands used by moorhens were ephemeral. The appearance of moorhens at newly flooded ephemeral wetlands indicates that intra-island movements between ephemeral and persistent wetlands occur but have not been observed.

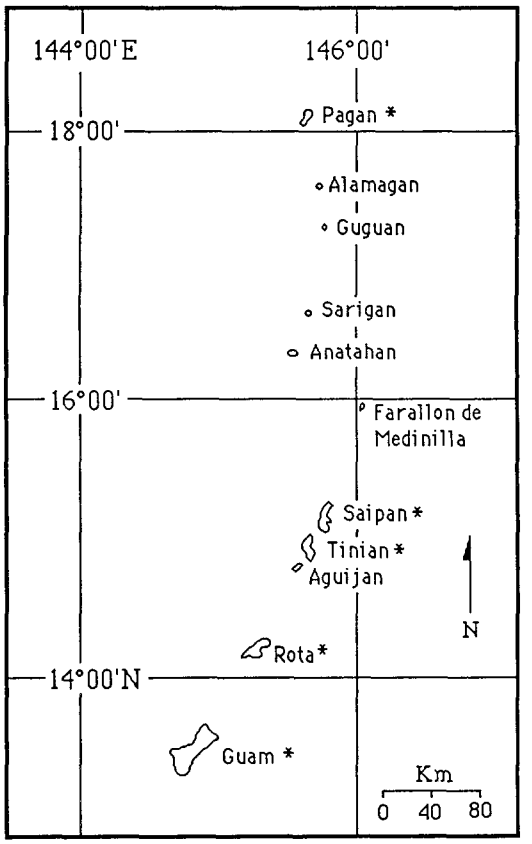

FIGURE 1. Distribution of the Mariana Common Moorhen (* = islands with records of occurrence).

Fena Valley Reservoir, a deep, open water reservoir with steeply sloping sides, is a major dry season refuge for moorhens. Fringing vegetation is limited to small isolated stands of emergents and some areas of the submergent *Hydrilla verticillata*. Our surveys indicate that moorhens prefer sites that support diverse emergent vegetation, contain both deep and shallow areas, and

TABLE 1. Size, location, estimated number of moorhens, and survey effort for Guam and Saipan wetlands.

Wetland site	Est. no. Moorhens	Size (ha)	Area open water (ha)	Survey effort		Location UTM[a]
				Man hr	No. visits	
Guam						
Barrigada pond	6	<0.5	0.4	0.5	2	N1490000 E261660
Prison pond	4	<0.5	0.5	0.5	2	N1487810 E260062
SGI[b] upper	5	<0.5	0.3	0.5	2	N1484375 E249630
SGI lower	3	0.5	0.5	0.5	2	N1404575 E249000
SGI west	6	0.8	0.4	0.5	2	N1484625 E249060
SGI diked fields	6	<0.5	0.3	0.5	2	N1484500 E249500
Fena Reservoir	32	81	77	6.0	2	N1478500 E250181
Agana Swamp	8	71	18	1.0	2	N1489500 E257250
Assupian pond	4	0.5	0.3[c]	1.0	2	N1472875 E256750
Yabai wetland	4	1.2	0.3	1.0	2	N1469430 E256250
Navmag pond	4	0.5	0.3[c]	1.0	2	N1481930 E248630
Navmag Swamp1	8	0.6	0.3	1.0	2	N1478560 E252560
Navmag Swamp2	8	1.6	0.5	1.0	2	N1479000 E252680
Pulantat west	4	1.2	0.6[c]	1.0	2	N1484580 E254310
CCP #3[d]	4	<0.5	0	0.5	2	N1479125 E257625
Sarasa pond	4	1.2	0.8[c]	0.5	2	N1475000 E253180
Masso Reservoir	4	1.6	1.2	1.0	2	N1488680 E250180
Tumon Bay Pothole	4	0.2	0.2	1.0	2	N1495310 E262300
Acapulco	8	0.8	0.4	1.0	1	N1475680 E255000
Saipan						
Susupe-Chalan-Kanoa Marsh	20	185	3	4	2	N1673-1676650 E360-362100
Susupe Lake	16	17	16	13	5	N1675300 E361400
Tanapag	2	17	0[c]	2	2	N1684100 E365500
Garapan	3	9	0.1	4	2	N1682200 E362600
Sadog Tase	10	10	0.1	7	14	N1683500 E364500
As Lito	5	2	0–2[c]	1	1	N1672900 E361900
Flores Pond	16	1	0–1[c]	13	13	N1674000 E362920
Kagman North	16	1	0.5	8	16	N1678100 E367150
Kagman South	2	0.5	0–0.5[c]	3	10	N1677160 E367200

[a] Universal Transverse Mercator coordinates.
[b] Shell Guam Inc.
[c] Seasonally flooded only.
[d] Country Club of the Pacific, hole no. 3.

have approximately equal portions of cover and open water. Even though this type of habitat is extremely limited at Fena, moorhen numbers typically increase during the dry season and decrease during the wet season. Monthly counts varied from a high of 66 birds in June 1988 to a low of seven birds in March 1989 (DAWR 1987–89). These data suggest that moorhens immigrate to the reservoir during the dry season as small ephemeral wetlands dry up and emigrate from the reservoir during the wet season as more wetlands become available.

No estimate of cumulative wetland loss is available for Guam, although it is certain that at least a moderate amount has been lost. Indicative of the problem is the gradual loss of wetlands due to changing agricultural practices. Rice and taro were grown on a small scale prior to World War II but are no longer extensively cultivated. The greater affluence and increasing population of the island have put additional pressure on wetlands for development. Major portions of the Agana Swamp have been filled since the early 1970s and smaller wetlands have been converted to agricultural, commercial and residential uses.

SAIPAN

Oustalet (1896) was the first to report moorhens on Saipan; he states that Marche collected six in 1887. However, there is no indication in the literature of how abundant moorhens were until after the American invasion of 1944. Long-time CNMI residents over 30 years of age often remark that moorhens were formerly abundant and commonly hunted. Stott (1947) reported that moorhens were "abundant" in the marsh sur-

rounding Lake Susupe in 1946, being "continually heard," but not often seen. Marshall (1949) states moorhens were "abundant" in freshwater marshes. More recent researchers have thought them less common and have provided population estimates. Pratt et al. (1979) saw only three during 38 man-days and thought moorhens were "much reduced in numbers," and that "hunting pressure is apparently great." Our counts at Lake Susupe (8, 14, 15, 16) were similar to a count of 18 reported by Tenorio and Associates (1979). Lake Susupe and all the surrounding marsh including the Chalan Kanoa area, account for about 202 ha (77%) of the remaining 260 ha of fresh water and estuarian wetlands. Army Corps of Engineers personnel estimated a population of 90–120 for the entire Lake Susupe-Chalan Kanoa area in 1978 (USACOE 1986); Tenorio and Associates (1979) estimated 60–100 in the area. Our conservative population estimate for all of Saipan is 100 birds (Table 1).

Human activities have reduced the amount and quality of freshwater wetlands. Filling has resulted in the loss of an estimated 64% of Saipan wetlands. Sugar cane and rice cultivation on Saipan (and Tinian) occupied most of the land area of the island during the 30 years of the Japanese mandate. Increased erosion and siltation have probably accelerated successional processes with the result that most of the remaining wetlands are entirely covered by thick vegetation, particularly *Phragmites.*

TINIAN

Oustalet (1896) was the first to report moorhens from Tinian. Gleize (1945) estimated 70 moorhens at Lake Hagoi. Recent records may indicate little has changed since the war, although Owen could only find one in 1974 (King 1981). Perhaps moorhens on Tinian were subject to heavy periodic hunting pressures. Estimates by CNMI-DFW biologists have ranged from two to "up to 200," but most estimates have been between 25 and 100. The highest numbers have been recorded during the dry season when other wetlands were dried up. However, though Lake Hagoi was thought to be persistent, it was dry during our visit in the 1990 dry season. Engbring et al. (1986) report the highest number ever seen at one time (100, with an estimated additional 25 present) during 1982. The wide range of estimates may indicate that moorhens make the 5 km flight between Saipan and Tinian regularly, but this has yet to be documented. The rarity of moorhens seen flying suggests that they fly primarily at night (Ripley 1977). Based on recent reports and a single visit to Tinian during the 1989 rainy season, we estimate a resident population of 75 moorhens.

Tinian does not have extensive wetlands. In 1742, there were reported to be two "considerable pieces" of fresh water that abounded with waterfowl and shorebirds (Barratt 1988). There were also reported to be forest ponds on Carolinas Hill until forest clearing increased evaporation in the 1930s (Nakajima 1944). Of the two large wetlands, only Lake Hagoi now has permanent open water. Hagoi usually has less than 1 ha of open water, but may provide a critical dry season feeding area when it supports the greatest concentration of moorhens in the Marianas (USFWS 1988). The other wetland, Makpo Swamp, is now completely choked with small trees (*Hibiscus tiliaceus*) and reeds. Makpo has been altered by past rice cultivation and probably reduced by a lowered water table due to pumping of nearby wells that began in the 1930s. Makpo will probably be further reduced by future water withdrawal (The Northern Islands Co. 1989). Moorhens are reported by residents at Makpo, but use seems to be sporadic and no estimates have been reported. The only other wetlands on Tinian include a few stock ponds, bomb craters, and temporarily flooded sites.

PAGAN

Two 16 ha lakes on Pagan supported a population of moorhens until recently. Moorhens were first recorded on Pagan by Takatsukasa and Yamashina (1932). Slightly brackish Inner Lake at the foot of Mt. Pagan had an extensive fringe of water fern (*Acrostichum aureum*); it supported an estimated population of over 50 birds in the 1960s (D. Aldan, pers. comm.). Lake Lagona supported fewer moorhens (20+) probably because it had less emergent vegetation, a higher salinity, and was subject to more impacts by humans and domestic animals (Corwin et al. 1957; D. Aldan, pers. comm.). Habitat damage by domestic animals became a problem in the 1960s and 1970s. Tenorio and Associates (1979) saw only one moorhen at Inner Lake and estimated the total population at less than 10. The 1981 volcanic eruption of Mt. Pagan caused the human inhabitants to leave the island and abandon domestic animals. CNMI-DFW biologists did not find moorhens in 1983 and reported that as a result of ash and cinder fall, together with over-

grazing and rooting by feral cattle and pigs, there was virtually no emergent vegetation visible at the lake. Six subsequent trips during 1984 through 1990 found the situation unchanged and concluded that the moorhens were extinct.

ROTA

Rota has no historical records of moorhens and presently has little or no permanently flooded freshwater wetlands (USFWS 1989). Recent archaeological excavations discovered three moorhens in three separate test pits that would indicate that moorhens were hunted by the early indigenous people (Becker and Butler 1988). The position of the moorhen remains indicated an age of 1,500–2,000 years ago (Butler 1988). Evidently wetland habitats existed at that time, but perhaps have long since succeeded to upland. Irrigated rice paddies are reported to have been maintained on Rota by Chamorros from prehistoric times up until this century (Marche 1889, Solenberger 1967). Increases in sea level since the last ice age may also have eliminated wetland habitats.

FACTORS AFFECTING MOORHEN POPULATIONS

Mariana Common Moorhens are difficult to count because they are somewhat secretive, often use pools within nearly impenetrable swamps and marshes, and move about to take advantage of ephemeral, seasonal, and persistent wetlands. Our estimate of their total population is 300–400. Moorhens have gone extinct recently on Pagan and apparently prehistorically on Rota. If population densities have not changed, then based on habitat loss and an estimate of 75 birds on Pagan, the Mariana moorhen population has probably been reduced in this century by 36–52%. Moorhen densities may have been reduced by competition with tilapia (*Oreochromis mossambicus*), introduced to Guam, Saipan, and Pagan for aquaculture in the 1950s (Eldredge 1988). Moorhens use most types of wetlands, but were not recorded at production aquaculture ponds on Guam. Also, a characteristic shared by the Saipan and Tinian wetlands with the highest moorhen densities (Hagoi, Flores, Kagman North) is the absence of tilapia. Aside from this potential competitor, the degradation and loss of wetlands through filling, pollution, siltation, and the encroachment of *Phragmites karka* have been and continue to be the greatest threat to Mariana wetlands. Feral animals and vulcanism have been factors in habitat loss on Pagan.

In addition to habitat loss, moorhens are probably affected by a host of mortality factors related to humans. Poaching, autos, and introduced animals may reduce moorhen numbers below the habitat's carrying capacity. Monitors (*Varanus indicus*), rats, cats, and dogs probably take their toll on eggs and chicks. Hunting or poaching in the CNMI has probably been an important mortality factor since World War II when guns became more readily available. Overhunting is thought to have been the most important factor in the extinction of the Marianas Mallard (Reichel and Lemke, in prep.). With the protection of the Endangered Species Act, hunting is no longer a cause of decline on Guam. In the CNMI, the present extent of poaching is unknown, but the moorhen's wariness and affinity for thick cover has probably allowed it to survive to the present.

Moorhens are opportunists and relatively prolific; they will probably survive these threats if their habitat can be secured and enhanced. The USFWS has recently instituted a "no net loss" policy for Mariana wetlands to protect the moorhen and the endangered Nightingale Reed-Warbler (*Acrocephalus luscinia*). If this policy can withstand challenges by developers and local politicians, the moorhens will survive for the immediate future.

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