The first accurate census of the endangered Hawaiian Moorhen (*Gallinula chloropus sandvicensis*)

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As an ornithologist, I am very interested in education and the conservation of wetland birds. My long-term career goals are to teach conservation, ecology and ornithology at the collegiate level and study poorly known waterbirds, especially those of conservation concern. As part of my doctoral program here at Tufts University, I am interested in further contributing to this type of work by studying the endangered Hawaiian Moorhen, a cryptic waterbird in the rail family. Appropriate species and habitat management to ensure the persistence of the six endangered waterbirds endemic to Hawaii's is hindered by a lack of life-history information, particularly for cryptic species such as rails. My goal is to do the first accurate census of this species, and to acquire sufficient information on demography and habitat use to understand the species' extinction risk and to help develop a protocol to better manage for the persistence of this endangered bird and potentially apply it to other endangered waterbirds. Here I will only discuss the census portion of the project.

Background:

The Hawaiian Moorhen is an endangered cryptic rail endemic to the Hawaiian Islands. Moorhen are found on Oahu and Kauai, and formerly on Maui, Molokai, and the Big Island. Wetland habitat, necessary for the persistence of this bird, has declined in area by 31% during the last 200 years (USFWS 2003). Historic and current population sizes of Hawaiian waterbirds have depended on habitat availability, which is determined largely by habitat conversion for housing and business, and on agricultural (e.g. taro, rice, sugar cane) and refuge construction (Broshears 1979, Griffin et al. 1989). The net result of human activities on Hawaii is a greatly fragmented and reduced wetland landscape (Shallenberger 1977, Coleman 1981, Griffin et al. 1989), which has caused disjunct distributions of waterbirds (Reed and Oring 1993, Engilis and Reid 1994, Reed et al. 1994). The risk to Hawaii's endangered waterbirds has been exacerbated by avian, mammalian, and amphibian predators introduced to Hawaii (Coleman 1981, USFWS 2003).

The Hawaiian Moorhen was considered to be at great risk of disappearance in the early 1940s, when population sizes dropped below 60 (Schwartz and Schwartz 1949). Although numbers have recovered some, its current population size and population trends are unknown. Moorhen are counted during the State-sponsored biannual waterbird surveys, but because the species is so secretive, the survey methods are considered inadequate for accurate census and monitoring (Chang 1990; Engilis and Pratt 1993). Results from the statewide waterbird surveys for the three previous breeding seasons are shown in Table 1.

Methods:

The most promising method to date for censusing cryptic marsh birds appears to be using broadcast calls to elicit vocalizations from local birds (Gibbs and Melvin 1993; Ribic et al. 1999; Conway and Gibbs 2001; Conway 2002). This method has proven successful for surveying other cryptic wetland bird species (Conway and Gibbs 2001). Based on this work, using calls from individuals of the same species increases the probability of detecting target species compared to simple visual surveys. Nagata (1983) tried using playback to count Hawaiian

Table 1: Number of adult Hawaiian Moorhen counted during August waterbird surveys, 2000 - 02. (Hawaii Natural Heritage Program, unpublished data.)

Year	Kauai	Oahu	Total
2000	138	138	276
2001	141	164	305
2002	84	166	250

Moorhen but got no responses. However, she used a recording of the North American subspecies rather than a local call.

I propose to do a statewide survey (Oahu and Kauai) of Hawaiian Moorhen, following recommendations made by Conway (2002). One survey point will cover 1600 m^2 of marsh; since wetlands in Hawaii are typically small (most are <50 ha), most wetlands will require few survey points. I will visit all wetlands surveyed on the biannual waterbird count, and any other wetlands that appear to have appropriate habitat for moorhen. If I have insufficient time or help to do this, wetlands known to have moorhen, based on that year's waterbird survey, will be surveyed first.

Playbacks will be of recordings of Hawaiian birds. For 5 min, I will listen for moorhens and record any calls that I hear. After 5 min of silence, I will play 30 sec of Moorhen calls (from those previously recorded) followed by 30 sec of silence; this will be done repeatedly for 2 min. Surveys will be done only during appropriate ambient conditions (low wind speed, no rain) (Bibby *et al*. 2000). Three surveys will be done during the breeding season (May – July 2003) in 10-day periods, with each period separated by seven days. Even though it will take repeated observations at the same site to determine detectability of individuals (detectability might vary by wetland cover and bird density), this information will be important to estimate population density (Chang 1990). Surveys will begin at sunrise, or as early as 30 min before sunrise, and end by 10 a.m. (as recommended by Conway 2002). Since birds are also active in the evenings (Bannor and Kiviat 2002), I will do evening surveys in the same sites to compare results between survey times. Playback survey results will be compared to results from this year's bi-annual waterbird survey.

The population status and viability of Hawaiian Moorhen are uncertain, and this uncertainty makes it difficult to manage for the persistence of this species. If the survey methods I propose evaluating are effective at determining moorhen numbers, it is likely that they will be included as part of the biannual waterbird survey (Paul Conry, Wildlife Program Manager, Hawaii Division of Forestry and Wildlife, pers. comm. to Michael Reed). If successful, the methods and results from this study would be important to the long-term management and conservation of not only the Moorhen but could also be useful for managing programs for other cryptic wetland birds known to be in decline (Tate 1986; Eddleman *et al.*1988; Conway *et al.*1994).

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