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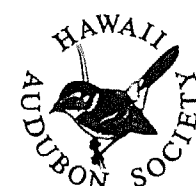
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Habitat Use and Nesting Activity by the Hawaiian Stilt (*Himantopus mexicanus knudseni*) and Hawaiian Moorhen (*Gallinula chloropus sandvicensis*) at the Hamakua Marsh State Wildlife Sanctuary, Kailua, O'ahu

Prepared by David G. Smith¹ and John T. Polhemus¹



Hamakua Marsh 1994



Hamakua Marsh 2002

Introduction

The Hamakua Marsh State Wildlife Sanctuary is a 22-acre (9 ha) wetland located in the heart of Kailua Town on O'ahu's windward side. The parcel has been managed by the State of Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife since being acquired in 1995. In 2001, limited funding for management prompted the initiation of the Hamakua Marsh Ecosystem Restoration and Community Development Project. The objective of the project is twofold: 1) restore wetland habitat for native Hawaiian water birds and migratory shorebirds and; 2) involve local organizations, businesses, schools, and county, state, and federal agencies in the process in order to integrate the wildlife sanctuary into the fabric

of the community. To date, over \$280,000 in grants have been awarded to the project, now entering its third year. Habitat restoration goals already completed include removal of red mangrove (*Rhizophora mangle*) from approximately four acres of stream bank, and out-planting of over 1000 nursery propagated native wetland plants. The next phase of restoration work will involve superficial grading to remove fill material over less than one acre, and the installation of a well and water delivery system to enable tighter control over water levels for bird use and maintenance. Hawaiian Stilts (*Himantopus mexicanus knudseni*), Hawaiian Moorhen (*Gallinula chloropus sandvicensis*), and

continued on page 60

Hawaiian Coots (*Fulica alai*) use Hamakua Marsh on a regular basis. Restoration efforts are expected to increase both resident and transient use of the wetland by these native waterbirds. The following is a synopsis of the 2003 nesting season and habitat use observations for Hawaiian Stilts and Hawaiian Moorhen at Hamakua Marsh.

Study Area

Hamakua Marsh State Wildlife Sanctuary (Hamakua) was originally a part of Kane'ohe Ranch Ltd. The parcel was donated to Ducks Unlimited in 1995, and subsequently sold to the State of Hawai'i for ten dollars. After several years of slow but steady progress, the efforts to restore the area were strengthened in 2001 by an influx of outside funding generated by the Hamakua Marsh Ecosystem Restoration and Community Development Project. In 2002, funding for the project enabled the removal of approximately four acres of mangrove forest from along Hamakua Canal.

Hamakua is divided into four basins (A-D), ranging from approximately two to eight acres (0.8 to 3.2 hectares) in size. All basins are characterized as seasonal floodplains fed by runoff from the Pu'u o 'Ehu hillside adjacent the wetland. Three of the four basins (B, C, and D) are bordered by Hamakua Canal, which also contributes to flooding of the area during the rainy season and high tidal influx. Rainfall for the area from July 2002 to June 2003 was 26.7 inches (67.8 cm, State of Hawai'i, Water Resources Commission Data). Stream water is brackish and tidal action and runoff from rainfall influence salinity throughout the wetland.

All four basins currently support low-lying vegetation dominated by the introduced pickle weed (*Batis maritima*). Restoration efforts have nearly eliminated Indian fleabane (*Pluchea indica*) and red mangrove (*Rhizophora mangle*) from the area. A variety of native wetland plants occur in the area, including 'akulikuli (*Sesuvium portulacastrum*), 'ahu'awa (*Cyperus javanicus*), makaloa (*Cyperus laevigatus*), makai (*Scirpus maritimus*), 'ae 'ae (*Bacopa monnieri*), and the endangered pu'u ka'a (*Cyperus trachysanthos*). Seashore Paspalum (*Paspalum vaginatum*), while introduced, is an important element of the stream bank vegetation, providing habitat for native and migratory species.

Predator control activities at Hamakua include year-round deployment of 0.05% diphacinone bait blocks in bait stations to control the Small Indian mongoose (*Herpestes auro-punctatus*)

and live trapping during the nesting season to control feral cats and mongooses.

Methods

Hawaiian Stilts

In an effort to gain a better understanding of their habitat use for restoration planning, Hawaiian Stilts were surveyed at Hamakua during 19 site visits between 30 January and 1 June 2003. Stilt observations were categorized by habitat type and by basin. Habitat types were as follows: stream, stream bank, open mudflat, mudflat with scattered vegetation, 0-3 inches of water, 3-6 inches of water, and greater than 6 inches of water. Stilt locations were recorded based on the initial habitat type in which the birds were observed. Recorded observations did not account for birds moving from one habitat type to another, and did not differentiate between an individual's activity (i.e. foraging, loafing, incubating, etc). No distinction was made between adult birds or chicks (when present). Nest sites were recorded using a Trimble GeoXT Model GPS unit and plotted in ArcView.

Nest monitoring was conducted at Hamakua between 10 March and 19 June 2003. Once located, nests were observed during subsequent site visits to determine status. Nests were checked to determine number of eggs per clutch and vegetation materials used to build each nest. Upon hatching, broods were monitored for survival of known chicks. Prior to fledging, chicks were captured by hand and banded with USFWS #4 stainless steel identification bands (right leg, above the tibiotarsal-tarsometatarsal joint).

Hawaiian Moorhen

Moorhen were present in Hamakua Marsh prior to mangrove removal, and did utilize the mangrove forest habitat for foraging, nesting and escape cover. The dense mangrove stands made accurate counts of the birds' nesting activity difficult. Mangrove removal resulted in the transformation of the habitat from a forested wetland to an open floodplain with very few remnant trees or shrubs, dominated by a mixture of *Paspalum* and *Batis*. Greij (1994) reported that nesting adults maintained home ranges that were adjacent and approximately parallel to roads and canals, apparently making territorial defense easier. The removal of mangroves provided an open view plane, and enabled territorial monitoring in conjunction with brood observation. Territorial boundaries became evident during repeated brood observations and were recorded using a Trimble GeoXT Model GPS unit and plotted in ArcView.

To minimize disturbance, nest searches were not conducted. Moorhen broods were monitored following initial discovery and were observed on each subsequent visit. An effort was made to locate all known chicks, but due to the cryptic nature of this species, chicks were not considered missing until they were not observed for three consecutive visits.

Results and Discussion

Hawaiian Stilts

A total of 460 stilt observations (n) were recorded during the 19 site visits. Total stilt observations for each visit ranged

between 17-35 birds (mean=24.2 per visit). Stilt observations by habitat type are shown in Table 1 and by wetland basin in Table 2 (see Appendix). Mudflat, mudflat with vegetation and 0-3 inches of water accounted for 96.3% of all initial stilt observations. From these observations, it becomes clear that shallow ponds with sparse or no vegetation along gradually sloping banks are their preferred habitat type at Hamakua. Mean tarsus measurements of adult Hawaiian stilts is 123 +/- 6.1 mm for males (n=43) and 116 +/- 5.94 mm for females (n=45; Coleman, 1981). The observed avoidance of water depths greater than 80 mm (approximately 3 inches) may be caused by an aversion to wetting the feathers on the belly, as described by Robinson, et al (1999).

A total of eleven nesting attempts were observed between 24 March and 27 May 2003 at Hamakua. Figure 1 shows nest locations throughout the wetland. Due to fluctuating water levels, plotted nest locations do not necessarily depict proximity to water, as readings were not taken until nests were no longer in use. However, they can be used to infer preferred use for nesting by basin and are useful to the ongoing restoration efforts. Nine of eleven nests were built on the ground, the other two slightly elevated on living *Batis*. Two nest sites were completely surrounded by water. Mean clutch size was 3.7 eggs (n=10, range 2-4, one nest failed before it could be checked). Of the eleven nests observed, all were built from *Batis* twigs, which were abundant due to the pre-season tilling of the ponds.

Four of eleven (36.4%) nesting attempts failed. Two failures were due to flooding following heavy rains on 26 March. One nest discovered late in the season (27 May) contained only two eggs, and was abandoned shortly after discovery. The cause of the fourth failure is not known. Judging from location, it appeared that this nest was built by one of the pairs that failed due to flooding. A nest was observed within four days of the flooding event, in the exact location, but slightly elevated on living *Batis*. Coleman (1981) reported that if water levels rise some nests are built up by placing dead vegetation under the nest. We could not confirm this, therefore these two nests are treated as separate attempts here. A third nest, built in the same vicinity (<3 m) as the first two, appeared later in the season and was successful, but without banded individuals, the identity of adults could not be confirmed.

The seven successful nests produced a total of 22 chicks (3.1 per nest). Hatching success was 60% for all nests (n=37 eggs from ten known clutches), and 82% for successful nests (n=27 eggs). 18 of 22 chicks survived to fledge (82%), and nine chicks representing four broods were banded. Fledglings per nest was 1.63 for all nests (n=11), and 2.57 for successful nests (n=7).

Two stilt chick mortalities were confirmed during the nesting season. On 6 June, two downy chicks attempted to cross Hamakua Drive. One was run over by a passing car, the second crossed successfully and was recovered by a veterinarian's assistant in an adjacent parking lot. The chick was held in a birdcage and hydrated prior to reintroduction to the wetland several hours later. Upon release, one adult immediately reclaimed the chick, while the other adult wandered the parking lot for over an hour, presumably searching for its lost chick (R.A. Carvill pers. comm.). On 18 June, a dead chick was recovered in B basin. The head had been removed, and a large puncture wound was visible on one leg, indicating some type of mammalian predator. Live

Appendix

Table 1. Hawaiian stilt observations (n=460) by habitat type at Hamakua Marsh State Wildlife Sanctuary, January 30-June 1, 2003.

Habitat Type	# of Observations	% Use
Stream	2	0.4
Stream Bank	6	1.3
Open Mudflat	78	17.0
Mudflat/Scattered Vegetation	69	15.0
0-3" Water	296	64.3
3-6" Water	9	2.0
>6" Water	0	0
Total	460	

Table 2. Hawaiian Stilt observations (n=460) by wetland basin (A-D) at Hamakua Marsh State Wildlife Sanctuary, January 30-June 1, 2003.

Basin	# of Observations	% Use
A	63	13.7
B	168	36.5
C	183	39.8
D	46	10.0
Total	460	

traps at the site were not active during this event, but diphacinone bait stations were stocked and showed little or no take from stations. The effectiveness of diphacinone at controlling mongoose, particularly in this area (Smith et al 2000) and removal of the bird's head, a violently broken wing and the abandonment of the carcass suggests the predator was a feral cat. Two cats had been captured in live traps and delivered to the Hawai'i Humane Society earlier in the season, but others may have avoided traps or entered the area while traps were inactive.

Hawaiian Moorhen

Moorhen chicks were first observed at Hamakua this season on 19 March 2003. Nine of ten moorhen pairs produced young, and one pair raised two broods, for a total of ten broods at Hamakua. Figure 1 shows territorial boundaries for the ten moorhen pairs at Hamakua. Territories ranged in size from 853 to 2,416 square meters. Territory size did not appear directly related to brood size, but more detailed monitoring may show otherwise.

A total of 44 moorhen chicks were observed throughout the season and brood sizes ranged from two to seven chicks (4.4 chicks/brood) at initial discovery. Only two chicks were not accounted for at the last observation on 3 July, a survival rate of 96%. Byrd and Zeillemaker (1981) reported that moorhen have an incubation period of 19-22 days. Although no nests were discovered, working backward from the first observed broods, nesting likely began at Hamakua in mid- to late February and ran through the middle of May.

The removal of the mangrove forest did not appear to deter moorhen use of the stream or surrounding areas. The *Paspalum/Batis* vegetation along the stream bank provided adequate cover for nesting birds. Despite the discovery of ten moorhen broods, no nests were observed over four months of monitoring. Adults and chicks easily made their way through low-lying vegetation, often disappearing completely under only 30-60 cm of growth. The canal and stream banks appeared to provide resident moorhen

continued ...

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with the majority of their required food and cover. On several occasions, birds were observed foraging out across the open flood plain, often approaching the upper extent of flooded areas. Territorial boundaries appeared less important on the flood plain than along the canal, as no territorial behavior was observed among moorhen in this portion of the habitat.

The survival rate of moorhen chicks may actually be lower than observed due to several factors. One brood of two chicks was not discovered until they were approximately one month of age. The initial brood size may have been larger than two chicks. Also, in the double clutch, there may have been more than three chicks initially in the first brood. The two unknown brood sizes would likely lower the overall survival rate.

Conclusions

The 2003 nesting season at Hamakua Marsh was the most successful season the area has experienced under DOFAW management. In previous years, no more than three stilt nests were observed, with no more than three chicks surviving to fledge in any one season. While a few moorhen broods were observed, little monitoring was possible because chicks were too difficult to find in the mangrove forest. Still considered a "work-in-progress," the Hamakua Marsh Ecosystem Restoration and Community Development Project has made significant progress toward both of its aforementioned goals. Superficial grading and installation of a well and water delivery system are included in the project's next phase, and findings from this season will provide a baseline for comparison following completion of those tasks.

The restoration effort at Hamakua can provide a variety of meaningful, in-depth research opportunities in fields such as botany, zoology, ornithology, ecology, and hydrology, among others. The Hamakua Marsh Ecosystem Restoration and Community Development Project has been incorporated into curriculum ranging from the local elementary level to graduate level research. In 2001/2002, 14 classrooms and over 350 students from three elementary schools performed research and created a website for the area (hamakuamarsh.com) in collaboration with Learning Education Technology and the University of Hawaii GK-12 Teaching Fellowship program. Graduate students from the University of Hawaii use the area as an outdoor classroom and laboratory for research on wetland invertebrates, water quality and native plant restoration. As managers of the project, DOFAW and the Hawai'i Chapter of The Wildlife Society welcome those interested in working together to better understand this wetland and its place in the community.

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¹ Department of Land and Natural Resources, Division of Forestry and Wildlife, 2135 Makiki Heights Drive, Honolulu, HI 96822.

Literature Cited

Byrd, G.V. and C. F. Zeillemaker. 1981. Ecology of nesting Hawaiian common gallinules at Hanalei, Hawai'i. *Western Birds* 12(3): 105-116.

Engilis, A. and T.K. Pratt. 1993. Status and population trends of Hawai'i's native waterbirds, 1977-1987. *Wilson Bulletin* 105(1): 142-158.

Greij, E.D. 1994. Common Moorhen. Pages 145-157 in T.C. Tacha and C.E. Braun, eds. *Migratory Shore and Upland Game Bird Management in North America*. International Association of Fish and Wildlife Agencies, Washington, D. C.

Robinson, J.A., J.M. Reed, J. P. Skorupa, and L.W. Oring. 1999. Black-necked Stilt (*Himantopus mexicanus*). In *The Birds of North America*, Number 449 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Smith, D. G., J.T. Polhemus, and E.A. VanderWerf. 2000. Efficacy of fish-flavored diphacinone bait blocks for controlling small Indian mongoose (*Herpestes auropunctatus*) populations in Hawaii. *'Elepaio* 60(6): 47-51.

Stemmerman, L. 1981. *A Guide to Pacific Wetland Plants*. Prepared by Science Applications, Inc. for the U. S. Army Corps of Engineers, Honolulu District. Contract #DACW84-70-C-0021, P00002.

Appendix

Table 1. Hawaiian stilt observations (n=460) by habitat type at Hamakua Marsh State Wildlife Sanctuary, January 30-June 1, 2003.

Table 2. Hawaiian Stilt observations (n=460) by wetland basin (A-D) at Hamakua Marsh State Wildlife Sanctuary, January 30-June 1, 2003.

Annual Membership Meeting and Program Meeting December 15th

Nick Kalodimos, a geography graduate student at UH Manoa, whose research interest is in spatial ecology of Hawaiian non-native bird species will give us a presentation entitled: "A Survey of Oahu's Free Living Parrots."

Christmas Bird Count Coordinator and Board member Arlene Buchholz is also planning to have a short summary of the Hawaii Christmas Bird Count 2003/2004 dates and sectors before Nick's talk at 7:30pm.

This meeting is also HAS's Annual Membership Meeting at which the election results will be announced and the 2004 officers and directors introduced.

Program meetings are held at Henry Hall Room 109 on the Chaminade University campus, 3140 Wai'ala'e Avenue, Kaimuki. Meetings are from 7:30 to 9:30pm. Refreshments will be served, and HAS publications, T-shirts, and other items will be available for purchase.