

CENSUS OF OAHU ELEPAIO IN HONOULIULI PRESERVE – FINAL REPORT

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## INTRODUCTION and BACKGROUND

The Oahu Elepaio (*Chasiempis sandwichensis ibidis*) is a monarch flycatcher endemic to the island of Oahu, and is listed as endangered under the U.S. Endangered Species Act (USFWS 2000). Other subspecies of Elepaio are found on Kauai (*C. s. sclateri*) and Hawaii (*C. s. sandwichensis*), but are relatively common and are not listed as endangered. The Oahu Elepaio has declined rapidly over the past few decades, and now occupies only 4% of its presumed prehistoric range (VanderWerf et al. 2001). Based on surveys conducted during the 1990s, the island-wide population was estimated to be about 1980 birds (VanderWerf et al. 2001). The distribution of Elepaio is highly fragmented, with six relatively large populations of 100 or more birds, and numerous small relicts with just a few birds. The Elepaio population in the southern Waianae Mountains was estimated to be the second largest on Oahu, with approximately 458 birds (VanderWerf et al. 2001). The majority of these birds were estimated to occur in Honouliuli Preserve, which is managed by The Nature Conservancy of Hawaii (TNCH).

The primary threats to the Oahu Elepaio are habitat loss and degradation, nest predation by alien black rats (*Rattus rattus*), and diseases carried by alien mosquitoes, particularly avian pox virus (*Poxvirus avium*) and avian malaria (*Plasmodium relictum*; VanderWerf and Smith 2002, USFWS 2006, VanderWerf et al. in press). Nest predation by black rats is currently the most serious of these threats (VanderWerf and Smith 2002). Rat control is known to be an effective means of increasing nest success of Elepaio and survival of female Elepaio (VanderWerf 2002, VanderWerf and Smith 2002), and is the best management tool currently available to aid in conservation of the species. Rats have been controlled to protect Elepaio in one area of Honouliuli Preserve, Ekahanui Gulch, since 1997 by TNCH and by the U.S. Army.

Elepaio have been observed in several different areas of Honouliuli Preserve, but only a few areas of the preserve have been systematically surveyed for Elepaio using song playbacks, which is the most effective method of detecting Elepaio (VanderWerf et al. 2001). Consequently, the number of Elepaio inhabiting much of the preserve is poorly known. In 2006, TNCH contracted Eric VanderWerf of Pacific Rim Conservation and Steve Mosher to conduct Elepaio surveys throughout Honouliuli Preserve. These surveys encompassed almost all areas of the preserve that contain suitable habitat for Elepaio, and provide current, accurate data on the distribution and abundance of Elepaio in Honouliuli Preserve. This information will be important for helping to guide future management of the area. Any concentrations of Elepaio pairs found during surveys in 2006 could be candidates for protection through rodent control.

## METHODS

Surveys for Elepaio were conducted by walking up or down each gulch, or along the contour road or trail, and stopping to play recorded Elepaio songs at approximately 50-100 meter intervals. Two different playback tapes were used; one with songs from Schofield Barracks that was used only on June 28, and a second tape with songs recorded on 28 June and 7 September 2006 in Honouliuli Preserve. Response by Elepaio to the Schofield tape was adequate, but response to the local Honouliuli tape was stronger. Elepaio often respond more strongly to local song dialects (VanderWerf in press), and this may largely explain the stronger response, but the recordings made in Honouliuli were also of higher quality and that also may have contributed to the stronger response.

After each playback the observer listened and watched for Elepaio for at least two minutes. Most Elepaio respond to recorded songs within one minute (VanderWerf in press, unpubl. data), but some birds approach quietly and must be searched for. The age and sex of

each bird were noted, as well as any behaviors or association with other Elepaio. The location of each bird was determined either by GPS, or if there was no GPS coverage, then with an altimeter and topographic map. Survey routes were plotted each day on topographic maps. Elepaio observed were counted as different individuals if they could be distinguished by color bands, by distinctive plumage, or if they occurred so far apart that it was likely they came from the same territory. The width of an Elepaio territory is usually about 100 meters but can vary depending on population density and forest type. Elepaio may move farther and may follow an observer for longer distances in areas with sparse populations, so an effort was made to track the movements of previously observed birds to avoid counting them twice.

Information about the habitat was also recorded in each location, including a general description of the terrain and a list of the dominant plant species. Elepaio prefer closed-canopy forest with a dense understory, and are more common in riparian habitat along streams than on ridges (VanderWerf et al. 1997, VanderWerf 1998). They avoid areas with scrubby forest on steep slopes and exposed ridges, and also avoid certain plant species, particularly ironwood (*Casuarina* spp.) and Eucalyptus (VanderWerf 1998). Elepaio often are found only in valley bottoms when the population is sparse and tend to be concentrated toward the back of valleys, which usually are wetter and support denser forest. Surveys therefore focused on valleys, and effort was made to survey the portion of each valley that contained the tallest and densest forest. In some cases this required hiking to the upper reaches of a valley, while in other areas this forest type occurred lower in the deeper, more shaded portions of the valley. Gulch names follow Welch, though in a few cases additional branches names are given that were not distinguished by Welch.

## RESULTS

### Elepaio Surveys

Seven days of surveys were completed by Eric VanderWerf on 7, 9, 12, 14, and 18 September and 19 and 24 October. An additional day of surveying was conducted by Eric VanderWerf on 28 June 2006 while he was employed by the U.S. Fish and Wildlife Service. The results of that survey are also included here, so this report includes data from eight days of surveys. The survey route on each day is shown in Figure 1.

A total of 47 Elepaio were observed, including 13 pairs (two birds each) and 21 single males (Table 1). The largest concentration of Elepaio occurred in Kalo'i Gulch along the Palehua Road, where there were 11 pairs and 10 single males. Moopuna Gulch and Manuwaikaalae Gulch South Branch also contained one pair each, which are fairly close to the Kalo'i Gulch and likely comprise part of the same subpopulation. Several of the birds were in subadult plumage, which at this season indicates they were one year old. However, not a single Elepaio fledgling was observed with any of the pairs. A detailed account of each gulch surveyed is provided below.

Weather conditions were good to excellent for surveys on all eight days. Winds were relatively calm each morning with limited sound distortion, allowing bird songs and playbacks to carry well. September 7 and 9 were largely overcast without much convective heating, causing bird activity to persist into the afternoon hours and allowing surveys to continue until 14:00-15:00 hours. September 12 and 14 were still and cool in the morning, providing ideal conditions, but became warmer and more windy in the afternoon, so surveys were discontinued at about 12:30 hours on those days. September 18 and October 19 were very still, with ideal conditions

for hearing birds. October 24 had good conditions in the morning but became somewhat windy in the afternoon.

### **Elepaio Mist-netting and Banding**

Five Elepaio were mist-netted and banded in and near Honouliuli Preserve during surveys in 2006 (Table 2). The main reason for banding them was to facilitate surveys by individually marking birds so neighboring pairs could be distinguished. If Elepaio monitoring is conducted in this area in the future these banded birds can be used to help with monitoring and to estimate annual survival. Birds were also examined for visible symptoms of avian pox virus (*Poxvirus avium*), and a blood sample was collected to test for avian malaria (*Plasmodium relictum*) and for genetic research. Information on plumage coloration was collected from each bird to be used in an island-wide study of plumage variation (E. VanderWerf unpubl. data). The Elepaio inhabiting the southern portion of Honouliuli Preserve occur in some of the driest habitat occupied by Elepaio on Oahu, and they have paler, grayer plumage compared to Elepaio in other parts of the island. Elepaio usually have 12 tail feathers, like most Passerine birds, but one male Elepaio banded in Kalo'i Gulch had 13 tail feathers. This is the first known occurrence of an extra tail feather in an Elepaio. Its cause and significance are unknown.

### **Elepaio Sound Recording**

Sound recordings of several Elepaio were made in and near Honouliuli Preserve during surveys in 2006. Elepaio often respond more strongly to local songs dialects, so recordings were made in the areas to be surveyed in order to obtain the strongest possible response. Digital audio (.wav) files of these recordings have been provided so they can be used in future surveys. Such recordings are valuable for documenting the variation in Elepaio song across the island and can be used in studies of song structure.

### **Oahu Amakihi**

The southern portion of the Waianae Range generally has more Amakihi than the northern portion, and Honouliuli Preserve in particular appears to support high densities of Amakihi in some areas. Amakihi abundance was highest in the southern portion of the survey area from the Palehua Road to Kaaikukui Gulch and in the northern end just south of Ekahanui Gulch, with lower abundance in the center (Table 1).

Because Amakihi are not territorial outside the breeding season and may move among areas, unlike Elepaio, the number of Amakihi observed cannot be used to estimate the actual population size. However, the number of Amakihi observed per hour can be used as an index of relative abundance. Different surveys methods are required to estimate population density and size for Amakihi, such as the Variable Circular Plot.

## **DISCUSSION**

Response by Elepaio to song playbacks was generally strong and the weather conditions were good to excellent on all days. There is thus no reason to suspect that the low number of Elepaio found in most areas was caused by failure of the surveys to detect birds. It is possible that a few birds were overlooked, but the results of these surveys should be regarded as generally accurate

In the late 1990s the Elepaio population in the southern Waianae Range was estimated to be about 458 birds, including 209 breeding pairs and 40 single males (VanderWerf et al. 2001).

The majority of these birds, 140 breeding pairs and 27 single males, were estimated to occur in Honouliuli Preserve and its immediate vicinity, with a smaller number in Lualualei Naval Magazine (E. VanderWerf unpubl. data). The current Elepaio population in the southern Waianae Range is much lower than the estimate made in the 1990s. The previous estimate may have been too high in some areas, but it is likely that most of the difference is real, and that there has been a serious decline in the number of Elepaio in the past 10 years.

The estimate from the 1990s was made by calculating the density of Elepaio territories in areas that had been surveyed, and extrapolating that density to other areas of suitable habitat that had not been surveyed. Only a few gulches in central Honouliuli had been surveyed at that time, and one of the gulches on which density estimates were based was Ekahanui Gulch, where Elepaio proved to be relatively dense. In retrospect, Elepaio likely occurred at lower density in some areas, so the estimated population may have been too high. However, Elepaio have disappeared from several gulches where they were known to have occurred in the past, (TNCH unpubl. data), though the density in these areas was never measured.

The highly skewed sex ratio observed in 2006, with a surplus of males, indicates the population must have been larger in the recent past, since there presumably were equal numbers of males and females at hatching. Most of the single males observed in 2006 probably had a mate at some point in their lifetime. Based on work in the southeastern Koolau Range, approximately 16% of male Elepaio have no mate in large populations, but the proportion of single males is higher in small and declining populations (VanderWerf et al. 2001).

The shortage of females and lack of fledglings indicate nest predation has been the main cause of decline (VanderWerf and Smith 2002). Female Elepaio are more vulnerable to predation by rats because they alone incubate at night, when rats are most active (VanderWerf 2002). The only other area in the southern Waianae Range that still has a substantial Elepaio population is Ekahanui Gulch, and this is the only area where there has been consistent rat control. Rat control is known to be an effective means of reducing nest predation, and it is likely that the small Elepaio population in Kaloi Gulch could be stabilized if rat control were conducted.

The small population size of Elepaio in the southern Waianae Range is cause for concern. The island-wide population was estimated to be about 1980 birds in the 1990s, and the southern Waianae population was thought to be the second largest, after the southern Koolau population (VanderWerf et al. 2001). Declines in Elepaio have also been observed in other areas, such as Schofield Barracks, Makua Valley, and Pahole Natural Area Reserve (U.S. Army, unpubl. data). Given the severe effect of nest predation on Elepaio nest success and survival of female Elepaio (VanderWerf and Smith 2002), these declines are not surprising. Further declines can be expected unless rat control is implemented on a larger scale.

## GULCH DESCRIPTIONS, FROM SOUTH TO NORTH

**1. Kaloi Gulch, Palehua Road**, 28 June, 7 September, and 19 October 2006. Although not part of Honouliuli Preserve and not an area originally scheduled for surveys, Elepaio were discovered by accident in Kaloi Gulch while driving along the Palehua Road. A single male Elepaio was first heard while driving along the Palehua Road on 28 June, in a flat area with many kukui trees approximately 100 meters south of the side road marked "JKL". This is south of Building 203. The bird was molting from subadult to adult plumage on 28 June, indicating it was two years old. Presumably the same bird was seen again on 7 September in adult plumage, and was captured and banded on 9 September, aluminum over white on the left leg and black over white on the

right leg. On all three occasions it was first observed approximately 50 meters east of the road, but it flew to the edge of the road in response to playbacks, and also flew across to the west side of the road.

The area was thoroughly surveyed on 7 September and 19 October, and proved to contain the most Elepaio of any area surveyed. A total of 11 Elepaio pairs and 10 single males were found in several adjacent drainages that cross the Palehua Road or road JKL. The area contains excellent Elepaio habitat, with many large kukui trees, fine stands of *Pisonia*, *Psychotria*, and *Pouteria* in some areas, scattered large *Sapindus* trees, and dense stands of strawberry guava (*Psidium guajava*) on some slopes. This area seems moister than the eastern slope of the Waianae Range, perhaps because the gulches are not as steep and are sheltered from the prevailing trade winds. All of the gulches were easily accessible from existing roadways, and no private driveways or posted areas were trespassed. The presence of so many single males indicates Elepaio in this area are suffering from nest predation, probably by black rats. It would be relatively easy to control rodents in this area using a grid of snap traps and bait stations because Elepaio territories were densely clustered, especially along the JKL road.

**2. Namoopuna Gulch**, 28 June 2006, 08:00-14:00 hours, and 9 September 2006. Most of this gulch was surveyed on 28 June, starting from near the Palehua Road at 2200 feet elevation down to the contour road at 1600 feet, and including the south fork up to 2000 feet elevation. The remainder of the gulch along the Puu Kuua access road from 1600 feet down to 1400 feet was surveyed on 9 September, after the road had been cleared. A total of five Elepaio were found, including one pair near the top of the gulch. The male of this pair was banded aluminum over green on the left leg and black over red on the right leg on 28 June, and had a small active pox sore on the third toe of the left foot. The lowest bird observed was along the Puu Kuua access road at 1520 feet elevation. Single male Elepaio have been observed in this general area several times in the past, including the saddle of Puu Moopuna (Dan Sailer) and 1600 feet elevation on the access road (EAV, Dan Sailer, and Trae Menard, 2001). It is possible all these observations are attributable to the same bird, which has no immediate neighbors and therefore may move around in the lower portion of this gulch.

**3. Manuwaikaalae Gulch South Branch**, 7 September 2006, 08:00-11:00. This gulch was surveyed from near the Palehua Road, at 2200 feet in the south fork and 2120 feet in the north fork, down to the contour road at 1740 feet elevation. The area below the contour road was surveyed down to about 1680 feet elevation by doing playbacks from adjacent areas of the contour road. Two Elepaio were found, an adult pair whose territory extended from 1920-2000 feet elevation and was centered on the junction of the two stream forks. This area was somewhat less steep than much of the gulch and supported the best mesic forest in the gulch, with many large kukui trees, numerous medium-sized *Pisonia* trees, and dense strawberry guava stands. The upper reaches of both forks did not have suitable habitat for Elepaio. The south fork had an overstory of very tall Eucalyptus and an open understory. The north fork was narrower and drier, with Eucalyptus dominating the south slope and ironwood dominating the north slope. The remainder of the gulch below the fork was somewhat drier and contained reasonably good habitat for Elepaio, but none were found. The area was dominated by dense stands of Christmasberry, but also had areas of guava, scattered large kukui trees, some medium-sized *Pisonia* trees, and a few *Sapindus* trees. A total of 14 Amakihi were observed in this gulch.

**4, 5. Manuwaikaalae Gulch Central Branch South and North Forks**, 7 September 2006, 11:00-13:00. This branch forks just above the contour road at 1740 feet elevation. Each fork contained some decent Elepaio habitat, but no Elepaio were found. The south fork was surveyed up to 2000 feet, and the north fork was surveyed up to 2120 feet. There was a small area of mesic forest where the stream crosses the road, with many large kukui and *Sapindus* trees. The south fork was narrower and was dominated by dense stands of Christmasberry. Habitat in this gulch was generally less favorable for Elepaio, with only small pockets of mesic forest containing kukui and other trees among the Christmasberry. The north fork was larger and had more area potentially suitable for Elepaio, though none were found. Much of this fork had scattered kukui trees, *Pisonia*, with some fine *Sapindus* trees too. The upper reaches of the gulch were less suitable for Elepaio and were dominated by dense stands of Christmasberry, with ironwood on the slopes. The area below the contour road was also surveyed down to about 1680 feet elevation by doing playbacks from adjacent areas of the contour road. A total of 11 Amakihi were observed in the two forks.

**6. Manuwaikaalae Gulch North Branch**, 7 September 2006, 13:00-13:30. This branch contained a small area of mesic forest where the stream crossed the road, but less than 100 meters above the road Christmasberry began to dominate and formed dense stands. Two playbacks were conducted just above and below where the contour road crosses the gulch, from about 1680-1800 feet elevation, but the remainder of the gulch was not surveyed because it did not appear to provide suitable habitat for Elepaio. Three Amakihi were observed visiting flowers and foraging on passion fruit along the contour road.

**7. Kaaikukui South Gulch South Branch**, 9 September 2006, 08:15-08:30. This small branch was narrow, dry, and steep, and was dominated by dense stands of Christmasberry. Two playbacks were conducted just above and below where the contour road crosses the gulch, from about 1700-1800 feet elevation, but the remainder of the gulch was not surveyed because it did not appear to provide suitable habitat for Elepaio.

**8. Kaaikukui South Gulch Central+North Branches**, 9 September 2006, 09:00-10:30. These two branches were surveyed together starting from the contour road at 1720 feet up to 2160 feet elevation. Much of the lower portion of the gulch was steep and dry, dominated by Christmasberry, and provided only marginal Elepaio habitat. At about 2040 feet elevation the gulch became broader and somewhat wetter, but the vegetation was dominated by tropical ash, under which there was virtually no understory. No Elepaio were found. This area was generally steeper than indicated by contour lines on the topographic map. The upper portion of the gulch was surveyed by Steve Mosher, who started from the Palikea Trail and went down to 2200 feet. Steep cliffs between these elevations prevent pedestrian traffic.

**9. Kaaikukui North Gulch South Branch**, 9 September 2006, 10:30-12:00. This branch and the next were surveyed partly by following up the gulches, and partly from a flagged trail that followed the intervening ridge. This branch was surveyed up to 2200 feet, and contained good Elepaio habitat over much of its length, with many kukui, *Sapindus*, and *Pisona* trees. A single male Elepaio was found in a flat area with a nice stand of *Pouteria*, *Sapindus*, *Pisonia*, and other native plants at 2120 feet elevation, GPS N 21 24.331, W 158 05.739. A total of 23 Amakihi were observed in Kaaikukui gulch.

**10. Kaaikukui North Gulch North Branch**, 9 September 2006, 10:30-12:00. This branch was narrower and shorter than the south branch, but still had some good Elepaio habitat, though no Elepaio were found.

**11. Palawai South Gulch**, 9 September 2006, 12:00-13:30. This gulch was surveyed from the contour road at 1720 feet elevation up to 1960 feet elevation. This portion of the gulch was drier and rockier than expected, and the habitat was dominated by Christmasberry and silk oak, with ironwood on the slopes. It provided only marginal Elepaio habitat, and no Elepaio were found. The upper portion of this gulch was surveyed by Steve Mosher, who started from the Palikea Trail and went down to 2600 feet.

**12. Palawai South Gulch (North Branch)**, 9 September 2006. This small tributary of South Palawai Gulch was steep, narrow, and dry. Two playbacks were conducted just above and below where the contour road crosses the gulch, from about 1700-1800 feet elevation, but the remainder of the gulch was not surveyed because it did not appear to provide suitable habitat for Elepaio.

**13. Palawai North Gulch South Branch**, 14 September 2006, 12:30-13:45 hours. This gulch was surveyed from the contour road at 1740 feet elevation up to 2060 feet elevation. The gulch splits at about 1860 feet elevation; only the south fork was surveyed because the north fork quickly became a steep, dry slope without any real forest. A single male Elepaio was found in the south fork at 1960 feet elevation, which responded to playbacks up to 2020 feet elevation. Wreckage from a crashed plane is spread out along the gulch bottom from 1960-2060 feet elevation. The habitat was dominated by dense Christmasberry, with a few *Sapindus* trees. A total of four amakihi were heard.

**14. Palawai North Gulch North Branch**, 14 September 2006, 08:30-12:15 hours. This long gulch forks at about 1960 feet elevation. The south fork contained the best example of native mesic forest of any site visited. A total of five Elepaio were observed, all single males, of which four were in the south fork. The gulch was surveyed from the contour road at 1740 feet elevation up to 2420 feet elevation in the south fork and 2260 feet in the north fork, and below the contour road down to 1600 feet elevation. A total of twelve amakihi were heard.

The north fork was dominated by Christmasberry, which had attained very large sizes due to the moist conditions. A small spring was found trickling down a rock face at 2040 feet elevation, and there were several native plants species in this area, including *Hibiscus arnottianus*, lama, *Sapindus*, mamaki, and *Pouteria*. A single elepaio was heard at 2060 feet elevation, but it responded only once to playbacks and was not seen.

The south fork had many more native plants than the north fork, but Christmasberry was still the dominant species. Four single male Elepaio were observed at 2060, 2140, 2200, and 2320 feet elevation. The highest bird was near a small enclosure (for *Schidea*?). All appeared to be single and no females were observed. All four birds responded strongly to playbacks, approaching quickly and closely, sometimes to within a few feet. This area contained a variety of native plant species, including many *Sapindus*, *Hibiscus*, *Pisonia*, *Psychotria*, *Pouteria*, a few *Perotettia*, and several species I did not recognize.

**15. Napepeiauolelo Gulch**, 14 September 2006, 0730-0820 hours. This gulch contained only marginal habitat for Elepaio, and none were found. Surveys were conducted from the road at 1600 feet elevation up to 1940 feet elevation, and below the road down to 1520 feet elevation. It was narrow and fairly dry, with the understory dominated by dense Christmasberry and the canopy dominated by Eucalyptus. Two amakihi were heard.

**16. Pualii Central Gulch**, 12 September 2006, 12:40-12:50 hours. This gulch was also steep, narrow, and dry. Most of the slopes were dominated by Eucalyptus. Two playbacks were conducted just above and below where the contour road crosses the gulch, from about 1400-1550 feet elevation, but the remainder of the gulch was not surveyed because it did not appear to provide suitable habitat for Elepaio.

**17. Pualii North Gulch (South Branch)**, 12 September 2006, 12:30-12:40 hours. The north and south branches of this gulch were not distinguished by Welch. This branch was short, steep, narrow, and dry. Two playbacks were conducted just above and below where the contour road crosses the gulch, from about 1400-1550 feet elevation, but the remainder of the gulch was not surveyed because it did not appear to provide suitable habitat for Elepaio.

**18. Pualii North Gulch (North Branch)**, 12 September 2006, 10:30-12:30 hours. The north and south branches of this gulch were not distinguished by Welch. The north branch forks right at the contour road. The north fork of the north branch is longer, broader, and contains better Elepaio habitat than the south fork. The north fork was surveyed from the contour road at 1500 feet up to 1980 feet elevation. The south fork was surveyed only up to 1600 feet elevation. A single male Elepaio was found in the north fork at 1800 feet elevation, near the unrolled fencing on the ground. The bird was extremely responsive to playbacks and to squeaking, approaching to within 10 feet and following approximately 100 meters up the gulch to 1860 feet elevation. The gulch became narrower and steeper at about 1960 feet elevation, with the vegetation dominated by Christmasberry and ironwood fairly low on the slopes. Four Amakihi were observed in this branch.

**19. Pohakea South Gulch South Branch**, 12 September 2006, 09:00-10:30 hours. This branch was very similar to the north branch of South Pohakea and also contained excellent Elepaio habitat, but none were found. It was surveyed from the contour road at 1640 feet elevation up to 2040 feet, and below the contour road down to 1500 feet. The bottom of the gulch contained many large kukui and *Sapindus* trees and many *Pisonia* in the understory. The lower reaches also contained many avocado trees. At about 2040 feet the gulch became steeper and narrower with more Christmasberry. No amakihi were observed in this gulch.

**20. Pohakea South Gulch North Branch**, 12 September 2006, 07:00-09:00 hours. This large branch contained a great deal of excellent Elepaio habitat, but, surprisingly, no Elepaio were found. The branch was surveyed from the contour road at 1640 feet elevation up to 2000 feet in the north fork and 2100 feet in the south fork. The gulch was also surveyed below the contour road down to 1500 feet elevation by conducting playbacks from the contour road. Large kukui dominated much of the gulch bottom, and in some areas *Pisonia* was the most common understory tree. The upper reaches supported many *Sapindus* trees and several fine specimens of *Hibiscus arnottianus*. The north fork ended at about 2000 feet elevation in a small bowl with

seemingly ideal habitat where Elepaio had been observed in the past, but none were found. The south fork was slightly longer but narrower and drier, and ended in steep slopes dominated by Christmasberry at 2100 feet elevation, with rocky cliffs above. No Amakihi were detected in this gulch.

**21. Pohakea North Gulch (South Branch)**, 24 October 2006, 07:30-08:00 hours. The south, central, and north branches of this gulch were not distinguished by Welch. This small branch contained only marginal habitat for Elepaio, with some large kukui in the gulch bottom, but little understory and slopes dominated by Eucalyptus. No Elepaio were found. The gulch was accessed by parking on the Pohakea Pass road at 1450 feet elevation and walking down into the gulch. The gulch was surveyed from 1320 feet to 1650 feet elevation, where the gulch ended in steep slopes.

**22. Pohakea North Gulch (Central Branch)**, 24 October 2006, 08:00-09:30 hours. The south, central, and north branches of this gulch were not distinguished by Welch. This branch contained some areas of good habitat with tall kukui trees and some guava in the understory, but no Elepaio were found. The gulch was surveyed from 1580 feet to 2040 feet elevation. The faint remains of the contour trail were observed at about 1680 feet elevation. There was a nice stand of *Pisonia* in a small bowl just below a cliff face at 1960 feet elevation. A total of 19 amakihi were detected in all four gulches surveyed on this day.

**23. Pohakea North Gulch (North Branch)**, 24 October 2006, 09:30-10:15 hours. The south, central, and north branches of this gulch were not distinguished by Welch. This small branch contained no Elepaio, but supported some areas of mesic forest at the back of the gulch that appeared suitable for Elepaio. There was a small pocket of *Pisonia* in the bowl at the back of the gulch. The gulch was surveyed from 1640 feet to 1960 feet elevation. The contour trail was somewhat more intact in this area, and could be followed in certain sections.

**24. Puumaialau Gulch South Branch**, 24 October 2006, 10:15-10:45. There was a small area of suitable Elepaio habitat in this small branch, but it was fairly narrow and dry over much of its length, and no Elepaio were found. This gulch was surveyed from 1640 feet to 1840 feet elevation.

**25. Puumaialau Gulch North Branch**, 10:45-12:30 hours. It was hoped that this large branch would support a number of Elepaio because it is close to Ekahanui Gulch, which has a relatively large Elepaio population. Unfortunately, no Elepaio were found. The gulch was surveyed from 1600 feet to 2080 feet elevation. The upper portion of the gulch was surprisingly shallow and dry, and was dominated by Eucalyptus and Christmasberry, with little mesic forest. There was no broad bowl at the back of the valley as indicated on the topographic map. The lower portion of the gulch, below the old contour trail, contained good Elepaio habitat with large kukui trees, some *Pisonia*, and dense strawberry guava in some areas.

## LITERATURE CITED

- U.S. Fish and Wildlife Service. 2000. Final rule to list as endangered the O`ahu `elepaio from the Hawaiian Islands and determination of whether designation of critical habitat is prudent. 65 FR 20760-20769.
- U.S. Fish and Wildlife Service. 2001. Endangered and threatened wildlife and plants: determination of critical habitat for the O`ahu `elepaio. Federal Register 66: 63752-63782.
- U.S. Fish and Wildlife Service. 2006. Revised Recovery Plan for Hawaiian Forest Birds. U.S. Fish and Wildlife Service, Region 1, Portland, OR.
- VanderWerf, E. A. 1998a. `Elepaio (*Chasiempis sandwichensis*). In The Birds of North America, No. 344 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- VanderWerf, E. A. 1999. Predator control, disease, and demography of the O`ahu `Elepaio. Report submitted to the Hawaii State Hawai`i Department of Land and Natural Resources, Division of Forestry and Wildlife.
- VanderWerf, E. A. 2001. Removal of rats decreases predation on artificial nests in O`ahu `Elepaio habitat. *Journal of Field Ornithology* 72:448-457.
- VanderWerf, E. A. In press. Biogeography of `Elepaio: evidence from inter-island song playbacks. *Wilson Journal of Ornithology*.
- VanderWerf, E. A., M. D. Burt, J. L. Rohrer, and S. M. Mosher. In press. Distribution and prevalence of mosquito-borne diseases in O`ahu `elepaio. *Condor*.
- VanderWerf, E. A., A. Cowell, and J. L. Rohrer. 1997. Distribution, abundance, and conservation of O`ahu `Elepaio in the southern leeward Ko`olau Range. *`Elepaio* 57: 99-106.
- VanderWerf, E. A., J. L. Rohrer, D. G. Smith, and M. D. Burt. 2001. Current distribution and abundance of the O`ahu `Elepaio. *Wilson Bulletin* 113:10-16.
- VanderWerf, E. A., and D. G. Smith. 2002. Effects of alien rodent control on demography of the O`ahu `Elepaio, an endangered Hawaiian forest bird. *Pacific Conservation Biology* 8:73-81.

Table 1. Summary of native forest bird surveys in Honouliuli Preserve conducted by Eric VanderWerf in September and October 2006. Gulch names follow Welch, and are listed from south to north. An asterisk (\*) indicates the number of amakihi was recorded together with adjacent gulches and a single abundance estimate was calculated. Amakihi abundance was not estimated in gulches where less than 30 minutes was spent.

Date	Survey area	# Elepaio pairs	# single male Elepaio	Time spent (hr:mn)	# Amakihi detected	Amakihi abundance (# per hour)
18 Sept 2006	Kaloi Gulch, Palehua Road	7	4	05:30	16	2.9
19 Oct 2006	Kaloi Gulch, Palehua Road	4	6	05:00	12	2.4
28 June 2006	Namoopuna Gulch	1	3	06:30	10	1.5
7 Sept 2006	Manuwaikaalae Gulch South Branch	1	0	03:00	14	4.7
7 Sept 2006	Manuwaikaalae Gulch Central Branch	0	0	02:00	11	5.5
7 Sept 2006	Manuwaikaalae Gulch North Branch	0	0	00:30	3	6
9 Sept 2006	Kaaikukui South Gulch South Branch	0	0	00:15	0	-
9 Sept 2006	Kaaikukui South Gulch Central+North Branches	0	0	01:30	*	
9 Sept 2006	Kaaikukui North Gulch South Branch	0	1	01:30	23	5.1
9 Sept 2006	Kaaikukui North Gulch North Branch	0	0	01:30	*	
9 Sept 2006	Palawai South Gulch	0	0	01:30	0	0
9 Sept 2006	Palawai South Gulch (North Branch)	0	0	00:15	0	0
14 Sept 2006	Palawai North Gulch South Branch	0	1	01:15	4	3.2
14 Sept 2006	Palawai North Gulch North Branch	0	5	03:45	12	3.2
14 Sept 2006	Napepeiaulelo Gulch	0	0	00:45	2	2.67
12 Sept 2006	Pualii Central Gulch	0	0	00:10	0	-
12 Sept 2006	Pualii North Gulch (South Branch)	0	0	00:10	0	-
12 Sept 2006	Pualii North Gulch (North Branch)	0	1	02:00	4	2.0
12 Sept 2006	Pohakea South Gulch South Branch	0	0	01:30	0	0
12 Sept 2006	Pohakea South Gulch North Branch	0	0	02:00	0	0
24 Oct 2006	Pohakea North Gulch (South Branch)	0	0	00:30	*	*
24 Oct 2006	Pohakea North Gulch (Central Branch)	0	0	01:30	19	3.8
24 Oct 2006	Pohakea North Gulch (North Branch)	0	0	00:45	*	*
24 Oct 2006	Puumaiialau Gulch South Branch	0	0	00:30	*	*
24 Oct 2006	Puumaiialau Gulch North Branch	0	0	01:45	*	*
Total	All	13	21	45:35	130	2.9

Table 2. Elepaio banded by Eric VanderWerf in and near Honouliuli Preserve in 2006. Color band combo is left leg top, left leg bottom, right leg top, right leg bottom. Color codes: A = aluminum; B = blue; G = green; K = black; R = red; W = white.

Date	Location	Color band combo	Sex	Age	Pox?	Notes
28 June 2006	Namooopuna	AGKR	Male	Adult	Active sore	
9 Sept 2006	Kaloi	AWKW	Male	Adult	Healthy	
18 Sept 2006	Kaloi	BRAK	Male	Adult	Healthy	
18 Sept 2006	Kaloi	AGRK	Female	Adult	Healthy	Extra tail feather
18 Sept 2006	Kaloi	KGGA	Male	Adult	Healthy	

Figure 1. Map of southern Waianae Mountains showing survey routes followed by Eric VanderWerf and locations where `Elepaio were detected.

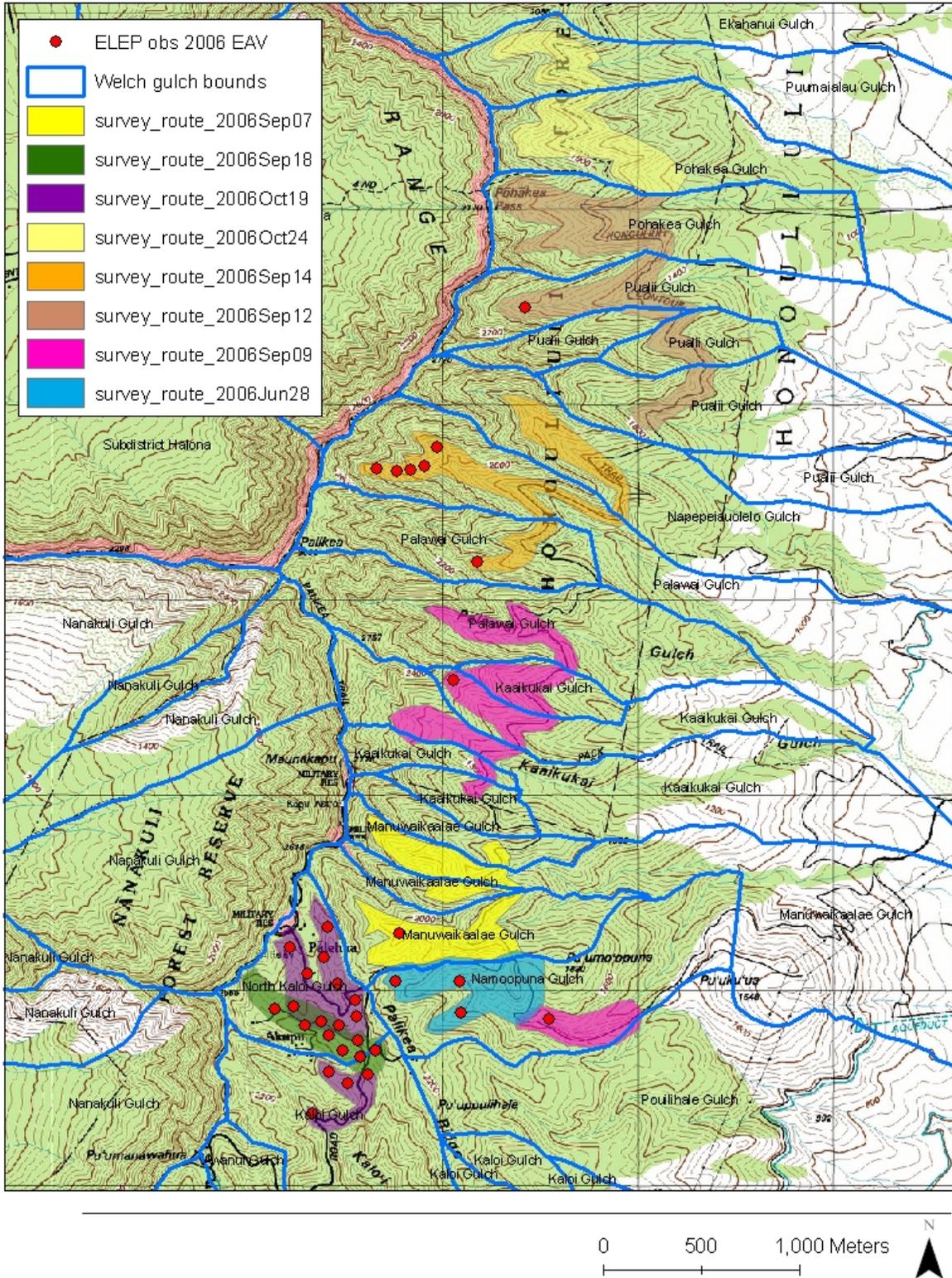


Figure 2. Photographs of male `Elepaio taken in Honouliuli Preserve by Eric VanderWerf during surveys in September 2006. Digital copies of these photos have been provided with this report. In the right hand photo note that the bird has 13 tail feathers; there is an extra tail feather on the right side of the bird.

