Rodent Control and O‘ahu ‘Elepaio Monitoring in Pia Valley – 2017 Final Report

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EXECUTIVE SUMMARY

This is the 22nd year of ‘elepaio monitoring in southeastern O’ahu. In 2017, the rodent control and ‘elepaio monitoring were expanded to include Pia Valley, in addition to Wailupe Valley. The work in Pia Valley in 2017 was conducted by Amanda Talpas, with supervision from Eric VanderWerf. Rodents were controlled in 10 ‘elepaio territories in Pia Valley in 2017. The 10 territories contained 6 breeding pairs, one single male, and three were vacant. 2017 was an average year for reproduction of O’ahu ‘Elepaio. A total of three ‘elepaio nests were found in Pia Valley in 2017, of which two were successful and one failed, and two had fledglings from nesting late last fall. ‘Elepaio nest success was thus 67%, which was slightly above the long-term average of 61%. Each successful nest produced one fledgling, and two other pairs raised a single fledgling late last fall. Productivity thus averaged 0.67 fledglings per pair, slightly below the long-term average of 0.71. Although ‘elepaio productivity was just average in 2017, it was much higher than in 2015 and 2016, which were very dry years. Rodent control was conducted with a combination of snap traps and automated pneumatic traps made by the Goodnature company. The capture rate of rats did not exhibit the typical pattern of decline over time, and there was some question about the palatability of the bait used in the Goodnature traps this year. The average capture rate of rodents in Goodnature traps (0.082 per trap-night) was only slightly higher than the capture rate in snap traps (0.078 per trap-night).

INTRODUCTION

ʻElepaio are territorial, non-migratory monarch flycatchers (Monarchidae) endemic to the Hawaiian Islands of Kauaʻi, Oʻahu, and Hawaiʻi (VanderWerf 1998). The forms on each island were treated as subspecies for many years, but morphological, behavioral, and genetic evidence indicate Elepaio on each island constitute separate species (VanderWerf 2007a, VanderWerf et al. 2009). In July 2010, the American Ornithologists Union officially changed the taxonomy of Elepaio so that each island form is recognized as a distinct species endemic to that island. The Kauaʻi ʻElepaio (*C. sclateri*) and Hawaiʻi ʻElepaio (*C. sandwichensis*) are fairly common and widespread (Scott et al. 1986), but the Oʻahu ʻElepaio (*C. ibidis*) is rare and locally distributed (VanderWerf et al 2001, 2013).

Oʼahu ʻElepaio have adapted relatively well to disturbed habitats composed of alien plants due to their flexible foraging behavior, broad diet consisting of diverse arthropods, and variable nest placement (Conant 1977; VanderWerf 1993, 1994, 1998; VanderWerf *et al.* 1997). Despite their adaptability, Oʻahu ʻElepaio have declined severely in the last few decades, and now occupy only 25% of the range occupied in 1975 and less than 4% of the presumed prehistoric range (VanderWerf *et al.* 2001). The total population was estimated to be approximately 1,980 birds in the 1990s, and it declined to an estimated 1,261 birds in 2012, which consisted of 477 breeding pairs and 307 single males (VanderWerf et al. 2013). The current range is about 5,187 ha in size but is fragmented into numerous small populations, many of which are isolated by urban and agricultural development (VanderWerf *et al.* 2001, 2013). The Oʻahu ʻElepaio was listed as endangered under the United States Endangered Species Act in April 2000 (USFWS 2000), is listed as endangered by the State of Hawaiʻi, and is considered endangered by the International Union for the Conservation of Nature (Birdlife International 2004).

The primary factors that currently threaten Oʻahu ʻElepaio populations are nest predation by alien black rats (*Rattus rattus*) and mosquito-borne diseases (VanderWerf and Smith 2002, USFWS 2006, VanderWerf et al. 2006, VanderWerf 2009). There is presently no practical method of controlling transmission of mosquito-borne avian diseases in forested environments in Hawaii, but rodent control has proven to be an effective method of increasing nesting success and survival of female ʻElepaio (VanderWerf and Smith 2002, VanderWerf 2009, VanderWerf et al. 2013). Ground-based rodent control has been conducted in several areas and by several agencies, including: the Honolulu Watershed Forest Reserve in collaboration with the Hawai`i State Division of Forestry and Wildlife since 1997; at Schofield Barracks West Range and Makua Military Reservation by the U.S. Army Environmental Division since 1998; in Ekahanui Gulch by The Nature Conservancy of Hawaiʻi and the U.S. Army since 2000; in Lualualei Naval Magazine by the U.S. Navy and U.S. Department of Agriculture Wildlife Services from 2002-2004; in Makaha Valley by the U.S. Army and the City and County of Honolulu Board of Water Supply from 2004 to 2009; in Moanalua Valley by the U. S. Army since 2005; at Palehua by The Nature Conservancy of Hawaiʻi and the U.S. Army since 2007, and in Waikane Valley by the U.S. Army from 2007-2009, and the Ohulehule Forest Conservancy in 2015.

This report summarizes information on rodent control efforts and ʻElepaio monitoring in Pia Valley in 2017. Pia Valley is located in the Honolulu Watershed Forest Reserve in southeastern Oʻahu and is part of one of the largest and densest ʻelepaio populations on the island (Figure 1; VanderWerf et al. 2013). For more detail on the ʻElepaio population in Wailupe Valley and previous management in the area, see VanderWerf et al. (2001), VanderWerf and Smith (2002), and VanderWerf et al. (2006), and VanderWerf (2009).

METHODS

Rat Control. Rats were controlled using a combination of Victor Professional rat snap traps (Woodstream Corp., Lititz, Pennsylvania, USA) and automated "A24" self-resetting rat traps powered by compressed gas canisters (Goodnature, Wellington, New Zealand). Snap traps were baited with peanut butter and were tied to trees off the ground or placed in small caves and overhangs to discourage scavenging, but were not covered. The automated A24 Goodnature traps were baited with a synthetic chocolate-based paste and were mounted onto trees with screws about 10 cm off the ground, as prescribed by the manufacturer. Snap traps were counted as having caught a rodent if hair or tissue was stuck to the trap, and traps were cleaned with a wire brush after each capture to remove evidence of previous captures. Counters were used to measure the number of activations of the automated Goodnature traps, and this was assumed to be an accurate measure of the number of rodents killed.

Snap traps (n = 21) and Goodnature traps (n = 9) were deployed on 25 January and were checked and re-baited at approximately weekly intervals until 17 May, after the last known ʻelepaio nest had finished. The Goodnature traps were placed in locations where the catch rate of rats has been high in the past to maximize the rate of rat removal. One Goodnature trap and two to three snap traps were placed in each ʻelepaio territory, resulting in an approximate density of four traps per hectare. Although this density seems low, traps were deliberately concentrated in sections of each territory known to have been used habitually for nesting, thereby increasing the efficiency of the control program.

ʻElepaio Monitoring.

Each ʻelepaio territory in Pia Valley where rodents were controlled was visited approximately once a week throughout the ʻelepaio nesting season. Most nests were located during the building phase by watching adult ʻelepaio gather nest material and following them to the nest. Nests were counted as successful if they fledged at least one chick, and nest success was calculated as the successful proportion of nests. Nest success was based only on nests known to have had eggs laid in them, as determined by observations of incubation or by using a pole-mounted mirror to look inside the nest. ʻElepaio fledglings are fed by their parents for 4-6 weeks after they leave the nest, are easy to locate by their persistent begging calls, and may stay on their natal territory for up to 9 months, until evicted by the parents at the start of the next breeding season (VanderWerf 1998).

RESULTS

Rat Control

A total of 21 snap traps and 9 automated A24 Goodnature traps were deployed in Pia Valley from 25 January until 17 May, for a total of 2,310 snap trap-nights and 982 automated trap-nights. A total of 180 rodents were caught in snap traps. Counters on the automated A24 Goodnature traps registered a total of 64 activations, and it is assumed that this is an accurate measure of the number of rodents killed. However, five of the counters proved to be defective and eventually were replaced, but the number of activations was not measured in those five traps in the interim, so the number of rats killed with the Goodnature traps was actually higher by an

unknown amount. Few rodent carcasses were observed below the automated traps because they were scavenged rapidly. The catch rate of rodents in snap traps and automated traps fluctuated throughout season, with several peaks in capture rate (Figure 2). Catch per trap-night over the entire study period averaged 0.078 in snap traps and 0.082 in the automated Goodnature traps.

‘Elepaio Monitoring

Rodents were controlled in 10 ‘elepaio territories in 2017 (Table 1). Of the 10 territories, 6 contained a breeding pair, one contained a single male, and three were not occupied this year. A total of three nests were found in 2017, of which two were successful and one failed. In the nest that failed it appeared that the eggs never hatched. Nest success was thus 67% (2 out of 3), which slightly above the long-term average of 61% (VanderWerf 2009).

Each successful nest produced one fledgling, and two other pairs raised a single fledgling late last fall. Productivity thus averaged 0.67 fledglings per pair (four fledglings from 6 pairs), slightly below the long-term average of 0.71 (Figure 3; VanderWerf 2009). The pairs that raised young last fall were found with a fledgling on the first two visits of the season in January. One of the fledglings was fully grown and foraging independently and probably had been out of the nest for at least two months. The other fledgling was still begging and was younger.

DISCUSSION and CONCLUSIONS

2017 was an average year for reproduction of O’ahu ‘Elepaio in Pia Valley, with nest success and productivity both similar to the long-term averages. Although productivity was only average, it was still much higher than in 2015 and 2016, which were very dry years because of El Nino weather patterns. Food availability for ‘elepaio is related to rainfall, with more insects and other arthropods available in wet years. Reproduction of ‘elepaio was higher in Wailupe Valley, the next valley to the west, with 19 pairs raising an average of 0.94 fledglings. The lower value in Pia Valley was likely just a result of the small number of pairs monitored.

The number of ‘elepaio in the portion of Pia Valley where rats were controlled in 2017 has declined somewhat since 2007, the last year when rats were controlled. This is not surprising, since ‘elepaio have declined island-wide because of nest predation by rats (VanderWerf et al. 2012). However, there were still enough breeding pairs to make the effort worthwhile, and it is hoped that continued management will allow the number of ‘elepaio to grow again. The presence of several single males is an indication that some females have been lost, probably because of nest predation by rats, but that is better than the territories being completely vacant.

It is very unusual for ‘elepaio to nest in the fall, yet two pairs in Pia Valley were found to already have fledglings with them in January; those pairs must have nested in the fall. This has been observed in several locations on Oahu since 2015, and appears to be an adaptive response by ‘elepaio to atypical rainfall patterns associated with El Nino climatic patterns. Usually Hawaii experiences wet winters and dry summers, but in 2015 and 2016 the pattern was reversed; the winters were very dry and rainfall in the summer was high because of frequent tropical storms. ‘Elepaio reproduction was very low in the usual winter/spring nesting season, but some pairs nested again in the fall. The two ‘elepaio pairs in Pia Valley that nested in the Fall of 2016 did not nest again during the usual nesting season in the spring of 2017. It will be interesting to see if they nest in the fall of 2017. We may be witnessing a shift in a basic aspect of the natural history of the O’ahu ‘Elepaio, from spring to fall nesting in response to climatic changes.

The rodent control program in Pia Valley appeared to be less effective in 2017 than in most previous years, although ‘elepaio nest success was still high, indicating it was still

sufficient to protect ‘elepaio nests. In most years the capture rate of rodents is high at first, then drops rapidly, and usually remains low for most of the season, indicating that rodent numbers have been suppressed. In 2017, the rodent capture rate was not that high at first and did not decline much over time, with several fluctuations. Five of the counters used to measure the catch rate of rodents were defective in 2017. The defective counters were returned to the manufacturer and were replaced, but there was a gap of several weeks when the catch rate at those traps was not measured, resulting in a smaller sample size and possibly contributing to the fluctuations in capture rate. Different bait was used for the automated Goodnature traps in 2017, a synthetic chocolate-based paste, which may have been less attractive to rodents than the peanut butter used in previous years. The surface of the chocolate bait developed a dry skin that may have reduced odor, and required tapping the bait out of the canister each week. Goodnature sells a small pump that ensures the bait paste is more readily available at all times, this device will be tried on at least some of the traps next year.

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Table 1. Summary of ‘Elepaio monitoring in Wailupe Valley in 2017. Age abbreviations: ATY = after third year (adult); TY = third year; SY = second year; Band colors; R = red; W = white; B = blue; G = green; M = mauve; K = black; P = pink, Y=Yellow.

Territory #	Rodent Control	Male Bands	Male Age	Female Bands	Female Age	Successful nests	Failed nests	Abandoned nests	# Young Fledged	Notes
02	No	NONE	TY							Single TY male seen twice in T2 and twice in T3
03	No	NONE	TY							Single TY male seen twice in T2 and twice in T3
04	No	NONE	ATY							Single male found 3 times, TY once, ATY once, and heard only once.
05	Yes	NONE	ATY							Single TY male seen 3 times, could be same male as in T2 and 3.
06	Yes	NONE	ATY	NONE	ATY				0	Secretive, female seen only in Jan and Feb, no nesting activity observed.
07	Yes									Birds from T8 observed in upper T7 sometimes.
08	Yes	NONE	ATY	NONE	AY				1	Fledgling seen with parents on 2 Feb, not begging, not being fed, at least 2 months out of nest, pair nested last fall.
09	Yes	NONE	ATY							Single male, sang a lot.
10	Yes									Male from T9 seen on lower T10 sometimes.
11	Yes	NONE	ATY	NONE	ATY				1	Fledgling heard on 25 Jan, calls were loud so must have been big. Pair nested late last fall.
12	Yes	NONE	ATY	NONE	ATY	0	1	0	0	Nest probably failed.
13	Yes	NONE	TY	NONE	TY	1	0	0	1	Nest probably successful.
15	Yes	NONE	ATY	NONE	ATY	1	0	0	1	Fledgling heard.
Total	**10**	**10**		**6**		**2**	**1**	**0**	**4**	

Figure 1. Map of Pia Valley showing locations of ʻelepaio territories (blue polygons). Rodents were controlled in 10 of these territories in 2017.

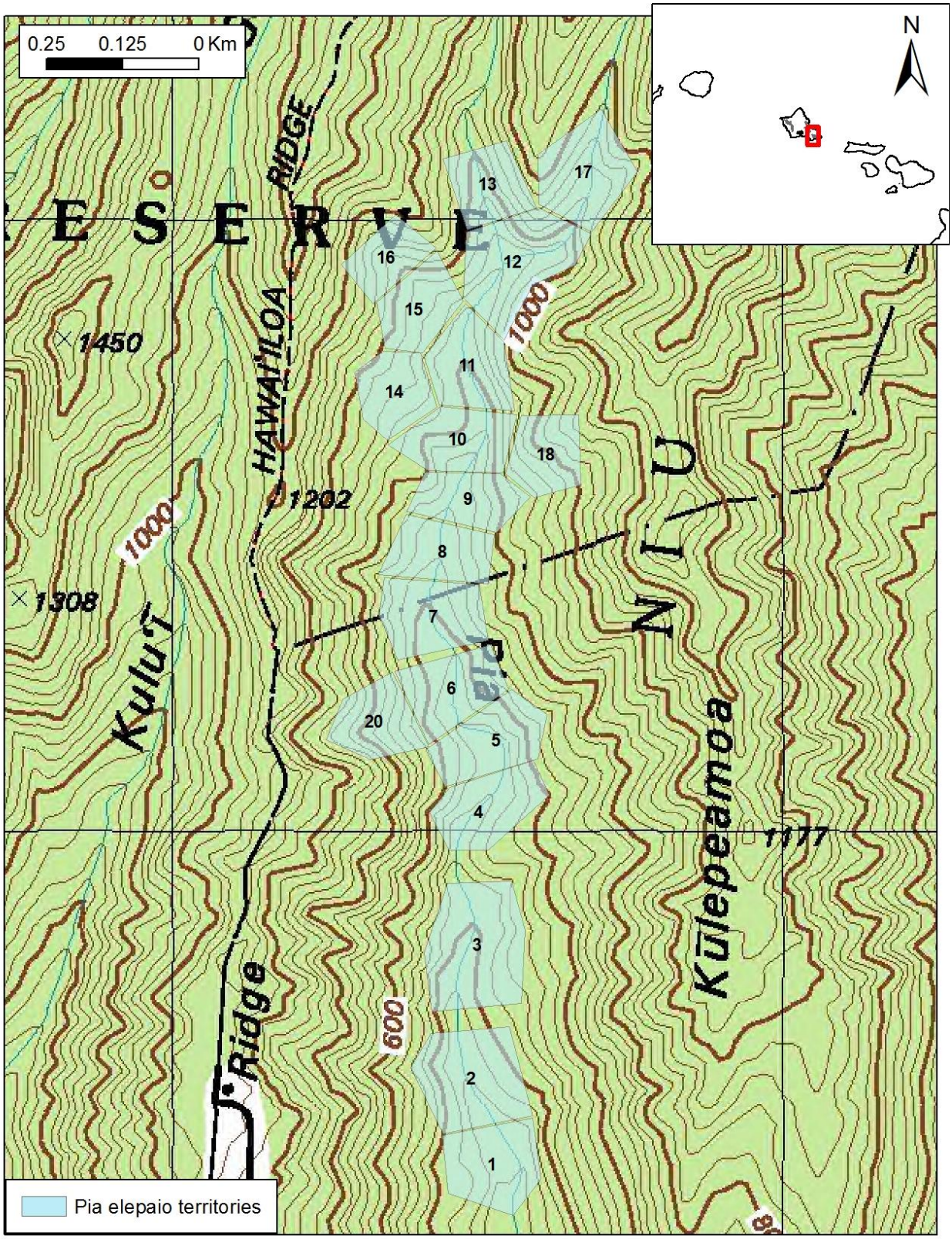

Figure 2. Catch rate of rodents in snap traps and automated Goodnature traps in Pia Valley in 2017. A total of 21 snap traps and 9 automated Goodnature traps were deployed from 25 January until 17 May. A total of 180 rodents were caught in snap traps and 64 rodents were caught in Goodnature traps. Average rodent catch over the entire period was 0.078 per trap-night in snap traps and 0.082 per trap night in Goodnature traps. The rodent control was less effective in 2017 than in most years and did not decline over time.