10.0 Strategy for Management of *Chasiempis sandwichensis ibidis*

Defining Oahu Elepaio Management for the Army

The approach to management of the Oahu elepaio, *Chasiempis sandwichensis ibidis*, taken in the Oahu Implementation Plan (OIP) is based on the requirements outlined in the U.S. Fish and Wildlife Service’s Biological Opinion (BO) (USFWS 2003). The numbers and distribution of Oahu elepaio have severely declined since the arrival of humans. The Oahu elepaio currently occupies approximately 4 percent of its original distribution. Over the last 30 years the range of the species has been reduced by 75 percent (VanderWerf et al. 2001, VanderWerf et al. 2007).

This reduction is likely due to a combination of factors that include historical habitat loss due to human use, habitat degradation by invasive alien species, and recent low adult survival and low reproductive success. The current low adult survival and reproductive success is attributed to nest predation by rats (*Rattus rattus*) and introduced diseases such as avian pox (*Poxvirus avium*) (VanderWerf 1999, 2001, 2004, VanderWerf and Smith 2002). Compounding the decline is a skewed sex ratio. Females are more susceptible to rat predation because they exclusively incubate the nests at night. Thus populations are often lacking female birds (VanderWerf 2001, VanderWerf and Smith 2002).

There are six large subpopulations remaining on Oahu, one of which occurs on SBMR West Range. This population was estimated to contain approximately 300 individuals in the mid-1990s, which was approximately 17 percent of the total estimated population of 1,980 birds across the island at that time (VanderWerf et al. 2001). However, more recent surveys of SBMR indicate the number of elepaio has declined (US Army unpubl. data). Historically, Oahu elepaio also occurred within KLOA and SBER action areas (Shallenberger and Vaughn 1977).

Rat control has proven to be a highly effective conservation action for this species (VanderWerf and Smith 2002). A ground based rat control program using snap traps and diphacinone bait stations has successfully increased reproductive success and the survival of adult females in southeast Oahu. Similar rat control programs have been in place at SBMR and MMR since 1998, in the Honolulu Forest Reserve since 1997, at The Nature Conservancy’s Honouliuli Preserve since 2000, in Lualualei Valley since 2002, in Moanalua Valley since 2006, and in Makaha since 2003.

In order to stabilize the Oahu elepaio, the Oahu BO recommends a long-term rat control program for 75 elepaio territories at SBMR and/or outside the action area. The target number of pairs to manage was determined to be roughly half of the estimated number of elepaio pairs within SBMR (USFWS 2003). The Army and the USFWS determined that there would be a mix of management inside and outside the action area that would total 75 pairs per season. This is due to the difficulty in obtaining enough field days within SBMR to manage all 75 pairs that are required. In addition, there has been a decline in the numbers of Oahu elepaio found within SBMR since the last estimate in the mid-1990s (U.S. Army unpubl. data).
Development of the Oahu implementation plan elepaio management plan
The Army has relied on the expertise of Eric VanderWerf via personal communication and published literature in the development of management plans for the Oahu elepaio (VanderWerf 1993, 1994, 1998, 1999, 2001, 2004; VanderWerf et al. 1997; VanderWerf et al. 2001; VanderWerf et al. 2007, VanderWerf and Smith 2002). Comparable to the stabilization efforts planned for *Achatinella* and plants, the emphasis for the Oahu elepaio is on threat control and habitat management. There are no immediate plans for captive propagation and eventual release of elepaio at this time.

On the ground management of Oahu elepaio requires a highly intensive effort during the breeding season from approximately December through June. Based on previous elepaio research by Army staff and Eric VanderWerf, the Army has been placing on average 3-4 bait stations and 6-12 snap traps in each mating pair’s territory. Because rats must have access to a constant supply of bait for 5-8 days in order to consume a lethal dose, this requires restocking the bait stations at least every 2 weeks for approximately 7 months. Monitoring success of elepaio nests also requires visiting each territory at least every two weeks. Monitoring efforts will play a major role in determining the success of the rodent control program. Thorough monitoring from year to year provides information on the nest success, fledgling and female mortality, site and mate fidelity, and emigration (if fledglings can be banded). Based on the results of these efforts modifications to current management tactics will be considered at the annual IT meetings.

Population Units and Management
As mentioned previously, the Oahu elepaio population units (PUs) were relatively easy to define compared to the plant PUs due to their disjunct and restricted ranges. The requirement from the 2003 Oahu BO (USFWS 2003) states that the Army must conduct threat control for 75 breeding pairs each breeding season. The Army has chosen to manage these 75 pairs at Schofield Barracks West Range, Ekahanui, Makaha, Moanalua, Palehua, and Waikane. The Army also manages any pairs found within the Makua Military Reservation as part of the Makua BO (USFWS 2007).

Management: The bulk of elepaio management consists of predator control, habitat management, and monitoring. At the beginning of each breeding season, surveys are conducted to determine the territory boundaries and whether each territory contains a breeding pair or a single male utilizing playbacks, mist netting, and visual observations of individuals. Rat bait stations and snap traps are then established within each breeding pairs’ territory. Occasionally, if a single male territory is found between two breeding pairs within a gulch the Army will still conduct rat control in the area to create a continuous rat free area. Or, it sometimes appears that a territory has a breeding pair and will be baited for the season only to find that it was a single male. In theory baiting for territories between breeding pairs may help the protected populations expand into new areas.

Habitat management can consist of ungulate and weed control. Ungulate control is an important factor in reducing pig wallows and therefore the abundance of mosquitoes which carry both avian malaria and avian pox virus. Weed control helps to restore native forest habitat, although elepaio will often nest in non-native trees (VanderWerf 1998, OANRP 2007). Many of the alien trees used for nesting by elepaio bear fruit and nuts that may attract rats into the forest canopy, possibly increasing the risk of nest predation (VanderWerf and Smith 2002).
**Monitoring and Success:** Without monitoring during the breeding season it is not possible to know whether the rodent control program is effective. For example, monitoring is necessary to determine whether nests are successful and whether breeding adults have survived from one season to the next. Monitoring is also needed to determine where nest sites are and rat bait stations and snap traps may be moved depending on the location of the nest. Additionally, if the first nest fails then monitoring may reveal a second nesting attempt, in which case a baiting station may need to be moved again. Field observations are accompanied by GIS records of territories and baiting grids.

The number of successful fledglings is essential information in the determining if the population is benefiting from management actions. Eventually, the success of the Army’s elepaio management actions will be partially determined by a demographic analysis calculating the populations growth rate ($\lambda$).

**Selected Bibliography**


10.1 Management Plan for *Chasiempis sandwichensis ibidis*

**Long Term Goals:**
- Maintain predator control programs for 75 breeding pairs of elepaio
- Monitor predator control effectiveness (i.e. band, re-sight, document fledgling success and adult survivorship)
- Control other threats at each managed field location
- Tier 1 management priority

**Table 10.1 Army Elepaio Management Summary**

<table>
<thead>
<tr>
<th>SUBPOPULATION</th>
<th>TOTAL POP SIZE</th>
<th># PAIRS</th>
<th># PROTECTED PAIRS</th>
<th># PROTECTED NON-PAIRS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waianae Mountains</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palehua</td>
<td>27</td>
<td>11</td>
<td>11</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>South Ekahanui</td>
<td>53</td>
<td>22</td>
<td>20</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Schofield Barracks West Range</td>
<td>&gt;47</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mohiakea)</td>
<td>14</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>(Banana)</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>(Baby water)</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>(North Haleauau)</td>
<td>15</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>(South Haleauau)</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Makaha</td>
<td>57</td>
<td>8</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Makua</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Koolau Mountains</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waikane</td>
<td>19</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Kahana</td>
<td>14</td>
<td>7</td>
<td></td>
<td></td>
<td>Candidate for management (State parks)</td>
</tr>
<tr>
<td>Moanalua</td>
<td>82</td>
<td>32</td>
<td>26</td>
<td>3</td>
<td>State owned</td>
</tr>
<tr>
<td>Totals:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>81 protected pairs</td>
<td>29 protected non-pairs (i.e. single males)</td>
<td></td>
</tr>
</tbody>
</table>

*Populations in bold are managed or are proposed for management.

**Taxon Specific Issues**
The Oahu elepaio (*Chasiempis sandwichensis ibidis*) has been in serious decline for the past few decades due to low adult survival and low reproductive success (VanderWerf et al. 2001, VanderWerf and Smith 2002). The two main causes of decline are nest predation by non-native black rats (*Rattus rattus*) and introduced diseases such as avian pox virus (*Poxvirus avium*) and avian malaria (*Plasmodium relictum*). This decline will likely continue without systematic rat control programs (VanderWerf and Smith 2002, VanderWerf et al. 2007). Ungulate control programs may also aid in reducing mosquitoes, the vector for both avian diseases.

**Discussion of Management Designations**
Management of the Oahu elepaio, *Chasiempis sandwichensis ibidis*, on Oahu Army training areas involves a predator control program for at least 75 breeding pairs, roughly half of the originally estimated 150 pairs at SBMR (Oahu BO USFWS 2003). The USFWS encouraged the Army in the
2003 Oahu BO to try to manage as many individuals in SBMR as possible. However, the management of all 75 pairs in SBMR is problematic as it is currently in use as a live fire training area. As a result, the Oahu Implementation Team (OIT) determined that a combination of management inside and outside of the action area could be utilized to meet the target number of 75 breeding pairs.

The Army has a separate requirement for the Makua Military Reservation (MMR), which is to conduct predator control for all pairs within the MMR action area. In 2008, the Army conducted rat control for 2 pairs and an additional single male territory (previously a pair in 2007).

The population units currently managed by the Army include SBMR West Range (10 pairs), South Ekahanui (20 pairs), Moanalua (26 pairs), Makaha (8), Waikane (4), Palehua (11). The total protected for the 2008 breeding season was 79 pairs for the OIP and 2 pairs for the MIP. Although the number of pairs managed at each site is listed here, the numbers will vary year by year due to fluctuation in the elepaio population. The goal of this management approach is to direct threat control across a range of populations to help in preserving the current distribution of elepaio on Oahu. The Army has chosen to focus on areas where there are no other management efforts underway and wherever there are sufficient numbers of breeding pairs to make predator control worthwhile. The Southern Koolaus were not proposed by the Army for management due to current management by other agencies (State of Hawaii) and volunteers.

The OIT recommended that, if given a choice, larger PUs should be protected rather than smaller PUs. This is due to the potential loss of birds to unprotected surrounding areas through emigration, and the larger “edge effect” in smaller PUs. In other words, many of the fledglings produced in a small protected group of breeding birds (i.e. sources) may emigrate to unprotected areas (i.e. sinks), thereby reducing the effectiveness of the control program. Whereas fledglings from a larger protected population are more likely to replace birds in existing territories as they die or establish new territories within the protected area. This is why the Army controls rats in some territories that currently contain only a single male. Currently, some of the populations managed by the Army may be considered too small (i.e. having too few individuals in too small of a geographic area). The number of pairs necessary to make management worthwhile is debatable and may change with new information. The OIT and the Elepaio Working Group will meet yearly to discuss priority populations to manage on Oahu based on monitoring and management data.

The Army has delineated elepaio predator control areas (Figures 10.1-6) that represent areas where active management may occur to reach the target number of breeding pairs. Currently, active management consists of monitoring and predator control in the form of rat bait stations and snap traps. The elepaio predator control areas do not follow the current proposed or existing MU fencelines but rather incorporate a pattern of the highest density of individuals, nearby historically known sites, and potential habitat close to existing individuals. Current locations of elepaio may change slightly over time as territories change and new individuals are discovered. Any aerial broadcasting of rodenticide will protect breeding pairs and allow fledglings to expand into ungulate free, protected areas.
Threats in the Action Area
Within the action area at SBMR West Range, threats to Oahu elepaio include direct impact from live-fire training, fire, habitat degradation by invasive alien plants and feral ungulates, introduction of new alien plant and animal species, nest predation by introduced rats and possibly feral cats and mongoose, and diseases carried by alien mosquitoes. One elepaio territory is known to occur partially across the firebreak road and has been affected in the past by road maintenance. It is assumed that all PUs are equally threatened by predators. Restrictions on access to elepaio management areas also limits the level of protection birds in the Action Area can receive.

Management Notes
Management for the Oahu elepaio will require extensive work during the breeding season, approximately December thru June. This work includes rat control for each breeding pair, monitoring adult survival, and monitoring nesting success. Additionally, each management site should be fenced to exclude ungulates. Once ungulates are removed, the Army may consider utilizing aerially applied rodenticide. As mentioned, the elepaio management areas (shaded in blue in Figures 10.1-10.8) do not follow proposed or existing fencelines but are representative of areas that may receive active management via monitoring and rat control.

The SBMR population (Figure 10.3) has received rat control in Mohiakea, Baby Water, and North Haleauau drainages for the past several years. The Army began rat control for elepaio in 1998 for a few territories. The Army has recently announced Schofield Barracks West Range will be open for conservation management 4 days/week during a range construction project through 2011. The Army natural resources program is proposing to build 3 significantly large fences within the next 2 years. These fenced units will provide approximately 975 ungulate free acres which may be candidate locations for aerial broadcasting of rodenticide. The use of aerially broadcasted rodenticide would allow for a much larger number of breeding pairs to be protected within SBMR. However, these fences are larger than any others proposed by this program and have not been scoped and there is a significant amount of unexploded ordnance in the area. Safety and funding concerns will be important considerations in determining if these fences can be constructed.

Portions of the Ekahanui population (Figure 10.4) have been protected for several years, initially by The Nature Conservancy in 2000, and for the last 4 years by the Army. This year, the Ekahanui subunit II fence will be complete, providing just over 200 acres for plant, snail, and elepaio management. The large number of pairs within the fence also makes this MU a good candidate for aerial broadcasting of rodenticide.

The Makaha population (Figure 10.5) has received rat control since 2003. This valley has not been thoroughly monitored by the Army in a couple of years. More pairs may be detected with additional monitoring in this coming year. There are a significant number of single males in this area.

The Moanalua population (Figure 10.8) has received rat control since 2006 and is also currently protected via a baiting and monitoring contract. In the last year 26 breeding pairs were protected. The Army plans to conduct additional monitoring this year to see if more pairs can be protected feasibly. The valley is now owned by the State and an overarching license agreement between the State and the Army is currently being drafted.
The Army began predator control for the **Waikane** population (Figure 10.7) in 2007. This site was chosen to be managed because there are no other management sites for this species on the windward side of the Koolau Mountains and was thought to be a significant contribution to the stabilization of the species in a geographic sense. However, this is the smallest of all populations that the Army manages, just 4 pairs were protected in the last year. The OIT has discussed either expanding the scope of predator protection to include more pairs or trying to manage 4 additional pairs in another population (i.e. dropping management at this site). In the coming year, the Army will conduct surveys to determine how many additional pairs may be feasibly managed in Waikane and neighboring Kahana valley. If there are few birds or the pairs are spaced too far apart, the Army may choose not to manage this population in the future. All changes will be discussed with the OIT.

The **Palehua** population was recently detected in 2006 along the Palehua subdivision road by Dr. Eric VanderWerf. The Nature Conservancy began baiting for this population in 2006 and the Army is working with TNC to provide financial support and monitoring; in the last year, 11 pairs were protected and monitored. This population appears to be expanding slowly.
### Table 10.2 Priority Management Actions for the Oahu Elepaio Army Predator Control Populations

<table>
<thead>
<tr>
<th>Population</th>
<th>Specific Management Actions</th>
<th>Partners/Concerns</th>
<th>Timeline</th>
</tr>
</thead>
</table>
| South Ekahanui (Honouliuli Preserve) | • Investigate aerial rodenticide drops  
• Baiting through contract for 20 pairs  
• Monitor adult survival and nesting success | • Need agreement with new landowner | • Continue baiting and monitoring via contract each breeding season |
| Schofield West Range              | • Construct Mohiakea and North Haleauau MUs  
• Baiting  
• Monitor adult survival and nesting success | • Access not reliable | • Construct Mohiakea and North Haleauau MUs in OIP yr 3; 2010  
• Continue baiting + monitoring each breeding season |
| Makaha                            | • Bait through contract  
• Monitor adult survival and nesting success | • Need new MOU with BWS landowner | • Continue baiting + monitoring each breeding season |
| Moanalua                          | • Bait through contract  
• Monitor adult survival and nesting success | • Need license agreement with the State | • Continue baiting + monitoring each breeding season |
| Waikane/Kahana                    | • Conduct surveys in Kahana to determine the extent of the PU  
• Monitor adult survival and nesting success  
• Have yearly ROE with landowner, Waikane Investment Corp., for access and baiting.  
• Need license agreement with the State | | • Continue baiting + monitoring each breeding season |
| Palehua                           | • Baiting during breeding season  
• Monitor adult survival and nesting success | • Currently have informal agreement with Palehua residents via TNCH for baiting.  
• Access via TNCH | • Continue baiting + monitoring each breeding season |
Map removed, available upon request

Figure 10.1 Current and historical locations of elepaio and Army active and proposed elepaio predator control areas on Oahu.
Figure 10.2 Current and historic elepaio locations and Army elepaio predator control areas in the Makua Action Area Northern Waianae Mountains, Oahu.
Figure 10.3 Current and historic elepaio locations and Army elepaio predator control areas in the Schofield Barracks West Range Action Area, Central Waianae Mountains, Oahu.

Final Oahu Implementation Plan 2008
Map removed, available upon request

**Figure 10.4** Current and historic elepaio locations and Army elepaio predator control areas in the Central Waianae Mountains, Oahu.

Final Oahu Implementation Plan 2008
Figure 10.5 Current and historic elepaio locations and Army elepaio predator control areas in the Central Waianae Mountains, Oahu.

Map removed, available upon request
Figure 10.6 Current and historic elepaio locations and Army elepaio predator control areas in the Southern Waianae Mountains, Oahu.
Figure 10.7 Current and historic elepaio locations and Army elepaio predator control areas in the Northern Koolau Mountains, Oahu.
Map removed, available upon request

**Figure 10.8** Current and historic elepaio locations and Army elepaio predator control areas in the Central Koolau Mountains, Oahu.