Picture-wing fly
(Drosophila obatai)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW

Species reviewed: Picture-wing fly (*Drosophila obatai*)

TABLE OF CONTENTS

5-YEAR REVIEW
Picture-wing fly/*Drosophila obatai*

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Endangered Species Program, Division of Recovery Jesse D'Elia, (503) 231-2349

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808) 792-9400

Cooperating Field Office(s):
N/A

Cooperating Regional Office(s):
N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on April 8, 2010. The review was based on the final rule to list 12 Hawaiian picture-wing flies, designation of critical habitat for 12 species of picture-wing flies from the Hawaiian Islands Final Rule, the Recovery Outline for 12 Hawaiian picture-wing flies, current published and unpublished materials and expert opinions and knowledge on the *Drosophila obatai* species. The draft five-year review was then reviewed by the Endangered Species Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before signature by the Pacific Islands Fish and Wildlife Office Field Supervisor and transmittal to the Regional Office.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 69 species in Idaho, Washington, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 75(67):17947-17950.

1.3.2 Listing history

Original Listing
FR notice: [USFWS] U.S. Fish and Wildlife Service. 2006. Endangered and threatened wildlife and plants; Determination of status for 12 species of picture-wing flies from the Hawaiian Islands. Federal Register 71(89):26835-26852.
Date listed: May 9, 2006
Entity listed: Species
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.3.3 Associated rulemakings:

[USFWS] U.S. Fish and Wildlife Service. 2008. Endangered and threatened wildlife and plants; Designation of critical habitat for 12 species of picture-wing flies from the Hawaiian Islands. Final Rule. 73(234):73794-73888.

Two critical habitat units totaling 44 hectares (110 acres) have been designated for *Drosophila obatai* on the island of Oahu.

1.3.4 Review History: N/A

1.3.5 Species' Recovery Priority Number at start of this 5-year review: 5

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Recovery Outline for 12 Hawaiian Picture-wing Flies
Date issued: August 2006
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

_____ ***Yes***
__X__ ***No***

2.1.2 Is the species under review listed as a DPS?

____ ***Yes***
_X__ ***No***

2.1.3 Was the DPS listed prior to 1996?

____ ***Yes***
____ ***No***

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____ ***Yes***
____ ***No***

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____ ***Yes***
____ ***No***

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

____ ***Yes***
__X_ ***No***

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

____ ***Yes***
_X__ ***No***

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

____ ***Yes***
____ ***No***

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

____***Yes***
____***No***

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:
A draft recovery plan for *Drosophila obatai* is being developed but was not published at the time of completing this 5-year review.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:
The general life cycle of Hawaiian *Drosophila* is typical of most flies: after mating, females lay eggs from which larvae (immature stage) hatch; as larvae grow they molt (shed their skin) through three successive stages (instars); when fully grown, the larvae change into pupae (a transitional form) in which they metamorphose and emerge as adults. *Drosophila obatai* larvae feed within decomposing portions of *Pleomele forbesii* (family Agavaceae), (Montgomery 1975). *Pleomele forbesii* is a candidate for Federal listing as endangered (USFWS 2005, USFWS 2011). Critical habitat for *Pleomele forbesii* on Oahu has been proposed (USFWS 2011). This host plant grows on slopes in dry forest and diverse mesic forest, and occurs singly or in small clusters, rarely forming large stands (Wagner *et al*. 1999).

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:
Bait can be used to survey for Hawaiian *Drosophila* but only to indicate the presence or absence of taxa. There is no technique currently available to uniquely mark individual flies and thereby quantify the number of *D. obatai* visiting the bait (K. Magnacca, *in litt*. 2010). In addition, Hawaiian *Drosophila* life cycles are influenced by rainfall patterns and other environmental variables, making survey results difficult to compare over time and across sites. Even the very common species of picture-wing flies fluctuate widely seasonally as well as daily, confounding negative survey records for a taxa (K. Magnacca, *in litt*. 2012b).

Drosophila obatai is historically known from two dry to mesic native forest localities from 460-760 meters (1,500 to 2,500 feet) in elevation on the island of Oahu. Nine individuals were recorded during two surveys in 1971, and the species had not been observed again until 2011 (K. Kaneshiro, *in litt*. 2005; K. Magnacca *in litt*. 2012a). Individuals of the species were last detected at Wailupe Gulch during November 1971, in the second of two surveys at that site. A second site, Puu Pane, was surveyed eight times between 1970 and 1991 with the last detection occurring in March 1971 (K. Kaneshiro, *in litt*. 2005). One female fly was observed March 2011 at the 460 meters (1500 feet) elevation in the Manuwai Gulch of the Mt. Kaala Reserve (K. Magnacca, *in litt.* 2012b). The rarity of this picture-wing fly and its host plant complicate estimating population and demographic trends.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):
No new information is available.

2.3.1.4 Taxonomic classification or changes in nomenclature:
Drosophila obatai was described by Hardy and Kaneshiro (1972), from specimens collected in the Waianae Mountains of Oahu. *Drosophila obatai* resembles *Drosophila sodomae* from Maui and Molokai and is distinguished by small differences in wing markings and the black coloration of the abdomen.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):
Drosophila obatai is historically known from two dry to mesic native forest localities from 460-760 meters (1,500 to 2,500 feet) in elevation on the island of Oahu. Nine individuals were recorded during two surveys in 1971, and the species had not been observed again until 2011 (K. Kaneshiro, *in litt*. 2005; K. Magnacca, *in litt*. 2012a). Individuals of the species were last detected at Wailupe Gulch during November 1971, in the second of two surveys at that site. The second site, Puu Pane, was surveyed eight times between 1970 and 1991 with the last detection occurring in March 1971 (K. Kaneshiro, *in litt*. 2005). One female fly was observed March 2011 at an elevation of 460 meters (1500 feet) in the Manuwai Gulch of the Mt. Kaala Reserve (K. Magnacca, *in litt.* 2012a). This location is approximately nine miles from the historical site in the Waianae Mountains where *D. obatai* was originally collected. The rarity of this picture-wing fly and its host plant complicate determining abundance and current range.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):
In accordance with section 3(5)(A)(i) of the Act and the regulations at 50 CFR 424.12, in determining which areas occupied at the time of listing to propose as critical habitat, we consider the Primary Constituent Elements (PCE) to be those physical and biological features that are essential to the conservation of the species and that may require special management or protection. The PCE for *Drosophila obatai* are: (1) dry to mesic, lowland, *Metrosideros polymorpha* (ohia) and *Acacia koa* (koa) forest between the elevations of 450–773 meters (1,475–2,535 feet); and (2) the larval stage host plant *Pleomele forbesii*, which exhibits one or more life stages (from seedlings to senescent individuals) (USFWS 2008).

A Final Rule establishing two critical habitat units for *Drosophila obatai*, went into effect January 5, 2009 (USFWS, 2008). *Drosophila obatai*-Unit 1-Puu Pane consists of 13 hectares (33 acres) of lowland, mesic, *Acacia koa* and *Metrosideros polymorpha* forest within the northeastern Waianae Mountains of Oahu. Ranging in elevation from 535–770 meters (1,760–2,535 feet), this unit is owned by the State of Hawaii and is largely managed as part of a State forest reserve.

Drosophila obatai-Unit 2-Wailupe consists of 31 hectares (77 acres) of lowland, mesic, *Acacia koa* and *Metrosideros polymorpha* forest within the southeastern Koolau Mountains of Oahu. Ranging in elevation from 445–655 meters (1,475–2,155 feet), this unit is privately and State-owned, and is largely managed as part of a state forest reserve.

According to the most recent survey data (K. Kaneshiro, *in litt*. 2005), these two units were occupied by *Drosophila obatai* at the time of listing. These units include the known elevation range, moisture regime, and native forest components used by foraging adults that have been identified as the PCEs for this species. These units also include populations of *Pleomele forbesii,* the larval stage host plant associated with this species.

The lack of regeneration or low levels of regeneration in the wild has been documented for *Pleomele forbesii*, the only known host plant of *Drosophila obatai*. Historically, *P. forbesii* was found in at least 11 areas, totaling an unknown number of individuals, in the Waianae Mountains (HBMP 2012). Currently, there are approximately 19 occurrences totaling 290 to 307 individuals, from the Mokuleia Forest Reserve, west to Keaau and south to Nanakuli, in the Waianae Mountains, and one occurrence of a few individuals in the Koolau Mountains (HBMP 2012). *Drosophila obatai* requires *P. forbesii* to complete its life cycle, but *P. forbesii* is becoming scarcer in the *D. obatai* habitat.

2.3.1.7 Other:

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

The habitat for *Drosophila obatai* and its host plant, *Pleomele forbesii*, is threatened by habitat destruction and modification from fire. Lowland mesic regions in Hawaii have been altered in the past 200 years by an increase in wildfire frequency, a condition to which the native flora is not adapted. The invasion of wildfire-adapted alien plants, facilitated by ungulate disturbance, has contributed to wildfire frequency. This change in wildfire regime has reduced the amount of forest cover for native

species (Hughes *et al.* 1991; Blackmore and Vitousek 2000) and resulted in an intensification of fire threat and feral ungulate disturbance in the remaining native forest areas. Habitat damaged or destroyed by wildfire is more likely to be revegetated by nonnative plants, such as *Melinus minutiflora* (molasses grass), that cannot be used as host plants by these picture-wing flies (HBMP 2012). Lack of regeneration or low levels of regeneration of the host plant, *Pleomele forbesii*, in the wild has been documented (HBMP 2012).

In its lowland mesic habitat, nonnative plant threats to *Pleomele forbesii*, the only known host of *Drosophila obatai*, include the understory and subcanopy species *Ageratina riparia* (Hamakua pamakani), *Ardisia elliptica* (shoebutton ardisia), *Blechnum appendiculatum, Buddleia asiatica* (dog tail), *Clidemia hirta* (Koster's curse), *Erigeron karvinskianus* (daisy fleabane), *Kalanchoe pinnata* (air plant), *Lantana camara* (lantana), *Passiflora suberosa, Rubus argutus* (prickly Florida blackberry), and *Rubus rosifolius* (thimbleberry) (HBMP 2012; USFWS 2011). Canopy species that pose threats to *Pleomele forbesii* include *Aleurites moluccana, Ficus microcarpa* (Chinese banyan), *Grevillea robusta, Heliocarpus popayanensis* (moho), *Morella faya* (firetree), *Psidium cattleianum, P. guajava, Schefflera actinophylla* (octopus tree), *Schinus terebinthifolius, Syzygium cumini, S. jambos* (rose apple), *Tecoma stans* (yellow elder), and *Toona ciliate* (Australian red cedar) (HBMP 2012; USFWS 2011).

Other major threats to *Drosophila obatai* habitat are feral ungulates, such as goats and pigs. In addition to the damage these nonnative herbivores cause by browsing and grazing on *Pleomele forbesii*; goats, pigs, and other ungulates that inhabit steep and remote terrain cause severe erosion of whole watersheds due to their foraging and trampling behaviors (Cuddihy and Stone 1990; Kishinami 2001). Disturbance caused by ungulates can lead to invasion of several nonnative plants, particularly *Psidium cattleianum, Rubus ellipticus* (yellow Himalayan raspberry), *Passiflora mollissima*, and *Pennisetum setaceum*, and contributes to the degradation of picture-wing host plant habitat on the island of Hawaii (Wagner *et al*. 1999; Science Panel 2005). *Psidium. cattleianum* and *Rubus ellipticus* form dense stands that exclude other plant species (Cuddihy and Stone 1990; Wagner *et al*. 1999), and the vine *Passiflora mollissima* overloads the branches of native trees and shades out native plants below (Wagner *et al*. 1999).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:
Overutilization is not known to be a threat to this species.

2.3.2.3 Disease or predation:

Disease is not known to be a threat to any of the Hawaiian picture-wing flies. However, predation, possible parasitism, and competition for resources by nonnative insects and other arthropods pose a grave threat to Hawaii's native *Drosophila* (Howarth and Medeiros 1989; Howarth and Ramsay 1991; Howarth et al. 2001). *Drosophila obatai* flies at all life stages, face substantial predation pressure from nonnative insects such as ants. The *Drosophila obatai* larval stage, faces resource competition from nonnative tipulid flies (crane flies, family Tipulidae) which also feed within the decomposing bark of *Pleomele forbesii* (Science Panel 2005). Currently, existing regulations offer inadequate protection to these species from the introduction of nonnative insects and the loss of their host plants.

The effects of predation by *Sophonia rufofascia* (two-spotted leafhopper) have been observed on *Pleomele forbesii* (HBMP 2012). This nonnative insect damages the leaves it feeds on, typically causing chlorosis (yellowing due to disrupted chlorophyll production) to browning and death of foliage (Hawaii Department of Agriculture 2012). The damage to plants can result in the death of affected leaves or the whole plant, from the combined action of its feeding and oviposition behavior (Alyokhin *et al.* 2004). In addition to the mechanical damage caused by the feeding process, the insect may introduce plant pathogens that lead to eventual plant death. While there has been a dramatic reduction in the number of two-spotted leafhopper populations in the past few years, (possibly due to egg parasitism), this nonnative insect has not been eradicated and predation by this nonnative insect remains a threat.

2.3.2.4 Inadequacy of existing regulatory mechanisms:
Regulatory mechanisms remain inadequate for thorough protection of the species, particularly quarantine regulations pertaining to the prevention of accidentally introduced arthropods, and augmentation and introduction of biological control agents in Hawaii.

2.3.2.5 Other natural or manmade factors affecting its continued existence:
Several species of nonnative rats, including the Polynesian rat (*Rattus exulans*), the roof rat (*Rattus rattus*), and the Norway rat (*Rattus norvegicus*), are present on the Hawaiian Islands and cause considerable environmental degradation (Kishinami 2001). The seeds, bark, and flowers of *Pleomele forbesii* are susceptible to herbivory by all the rat species (Science Panel 2005; K. Magnacca, *in litt*. 2005). The herbivory by rats causes host plant mortality, diminished vigor, and seed predation, resulting in reduced host plant fecundity and viability (Science Panel 2005; K. Magnacca, *in litt*. 2005).

The effects of climate change on picture-wing flies and host-plant range will likely be significant. Life cycle characteristics such as length of

larval period and adult longevity are highly dependent on temperature and other environmental factors affected by climate change. In general, stage length and longevity decrease with temperature increase. Fecundity and sex ratio may also be influenced by temperature in some species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

2.4 Synthesis

Picture-wing fly, *Drosophila obatai,* is an endangered endemic species found only on the island of Oahu. *Drosophila obatai* is historically known from two dry to mesic native forest localities from 460-760 meters (1,500 to 2,500 feet) in elevation where the larval host plant, *Pleomele forbesii*, is present. *Pleomele forbesii* is also a candidate for listing and critical habitat designation.

The PCE for *Drosophila obatai* are: (1) dry to mesic, lowland, ohia and koa forest between the elevations of 450–773 meters (1,475–2,535 feet); and (2) the larval stage host plant *Pleomele forbesii*, which exhibits one or more life stages (from seedlings to senescent individuals) (USFWS 2008). On January 5, 2009, the Final Rule establishing critical habitat for *D. obatai*, went into effect. Two critical habitat units, one in the Waianae Mountains and one in the Koolau Mountains have been designated for *D. obatai* on the island of Oahu. According to the most recent survey data, these two units were occupied by *D. obatai* at the time of listing. These units include the known elevation range, moisture regime, and native forest components used by foraging adults that have been identified as the PCEs for this species. These units also include populations of *P. forbesii*, the larval stage host plant associated with this species.

Nine *Drosophila obatai* individuals were recorded during two surveys in 1971, and the species had not been observed again until 2011, when a female was observed at an elevation of 460 meters (1500 feet) in Mt. Kaala Reserve, in the Waianae Mountains. The rarity of this picture-wing fly and its host plant complicate determining population demographics, abundance, and current range.

Current threats to *Drosophila obatai* and its larval host plant, *Pleomele forbesii*, include feral ungulates, such as goats and pigs; ants, tipulids, two-spotted leafhopper, and other nonnative insects; rats; invasive plants; and wildfire. Lack of regeneration or low levels of regeneration of the host plant, *P. forbesii* in the wild has also been documented. Lands with suitable habitats and those that are designated as critical habitat need management and control for these threats. Currently, existing regulations offer inadequate protection to these species from the introduction of nonnative insects and the loss of their host plants. Climate

change may significantly impact the life cycle characteristics of *D. obatai* and the range of its host plants. A draft recovery plan for this species is being developed.

Only a single observation of *Drosophila obatai* has been reported since the species was listed as endangered under the Endangered Species Act. Most threats are not being managed. Therefore, *D. obatai* meets the definition of endangered, as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X__ No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

N/A

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

1. Develop and implement a Recovery Plan.

2. Protect *Drosophila obatai* and *Pleomele forbesii* habitat and control fire, rat, nonnative insects, and ungulate threats.

3. Eliminate or manage nonnative plants that compete with *Pleomele forbesii* and increase wildfire risk.

4. Survey and document predatory threats.

5. Develop and implement a systematic *Drosophila obatai* survey and monitoring plan that includes historic habitats and other suitable habitats.

6. Evaluate the need to re-establish or supplement *Pleomele forbesii* and wild picture-wing fly populations within their historical range.

7. Conduct research on restoring or improving regeneration (reproduction) of *Pleomele forbesii*

5.0 REFERENCES

Alyokhin A.V., P. Yang, R.H. Messing. 2004. Oviposition of the invasive two-spotted leafhopper on an endemic tree: Effects of an alien weed, foliar pubescence, and habitat humidity. Journal of Insect Science 4:13. 7 pp. Online publication insectscience.org/4.13.

Blackmore, M., and P.M. Vitousek. 2000. Cattle grazing, forest loss, and fuel loading in a dry forest ecosystem at Puu Waawaa Ranch. Biotropica 32:625-632.

Cuddihy, L.W., and C.P. Stone. 1990. Alteration of the Native Hawaiian Vegetation; Effects of Humans, Their Activities and Introductions. Cooperative National Park Resources Studies Unit. University of Hawaii. Honolulu, Hawaii.

Hawaii Department of Agriculture. 2012. Two-spotted leafhopper project. http://hawaii.gov/hdoa/pi/ppc/2shopper/?searchterm=two spotted leafhopper. Last accessed May 9, 2012.

Hardy, D. E., and K.Y. Kaneshiro. 1972. Chapter 5, New picture-winged *Drosophila* from Hawaii. Part III. (Drosophilidae, Diptera). Pp. 155-161. *In*: M. R. Wheeler (Ed.). Studies in Genetics VII. University of Texas Publication No. 7213. Austin, Texas.

[HBMP] Hawaii Biodiversity and Mapping Program. 2012. Mapping services and the Pacific Basin information node ArcIMS site. Center for Conservation Research and Training, Pacific BioSciences research Center, University of Hawaii. http://www.hbmp.hawaii.edu. Last accessed May 9, 2012.

Howarth, F.G., and A. Medeiros. 1989. Non-native invertebrates. Pp. 82-87. *In*: C. P. Stone and D. B. Stone (Eds.). Conservation Biology in Hawaii. Cooperative National Park Resources Studies Unit. University of Hawaii. Honolulu, Hawaii.

Howarth, F.G., and G.W. Ramsay. 1991. The conservation of island insects and their habitats. Pp. 71-107. *In*: N. M. Collins and J. A. Thomas (Eds.). The Conservation of Insects and Their Habitats. Academic Press. London. UK.

Howarth, F.G., Nishida, G.M., and N.L. Evenhuis. 2001. Insects and other terrestrial arthropods. Pages 41-62 in Hawaii's invasive species. A Hawaii Biological Survey Handbook. Mutual Publishing and Bishop Museum Press. Honolulu, Hawaii.

Hughes, R. F., P. M. Vitousek, and T. Tunison. 1991. Alien grass invasion and fire in the seasonal submontane zone of Hawaii. Ecology 72:743-46.

Kishinami, C. H. 2001. Mammals. Pages 17-20 in G.W. Staples and R.H. Cowie (Editors), Hawaii's Invasive Species. Mutual Publishing and Bishop Museum Press. Honolulu, Hawaii.

Montgomery, S. L. 1975. Comparative breeding site ecology and the adaptive radiation of picture-winged *Drosophila* (Diptera: Drosophilidae) in Hawaii. Proceedings of the Hawaiian Entomological Society 12:65-103.

Science Panel for 12 Species of Hawaiian Picture-wing Flies. 2005. Notes for science panel hosted by the Pacific Islands Fish and Wildlife Office, November 15 to 16, 2005. 23 pp.

[USFWS] U.S. Fish and Wildlife Service. 2005. Endangered and threatened wildlife and plants; Review of native species that are candidates or proposed for listing as endangered or threatened; Annual notice of findings on resubmitted petitions; Annual description of progress on listing actions. Federal Register 70:24870-24934.

[USFWS] U.S. Fish and Wildlife Service. 2006. Endangered and threatened wildlife and plants; Determination of status for 12 species of picture-wing flies from the Hawaiian Islands. Federal Register 71:26835-26852.

[USFWS] U.S. Fish and Wildlife Service. 2008. Endangered and threatened wildlife and plants; Designation of critical habitat for 12 species of picture-wing flies from the Hawaiian Islands. Final Rule. 73:73794-73888.

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 69 species in Idaho, Washington, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 75:17947-17950.

[USFWS] U.S. Fish and Wildlife Service. 2011. Endangered and threatened wildlife and plants; Listing 23 species on Oahu as endangered and designating critical habitat for 124 species. Federal Register 76:46362-46410.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawaii. University of Hawaii Press and Bishop Museum Press. Honolulu, Hawaii. 919 pp.

***IN LITT.* REFERENCES**

Kaneshiro, K. *in litt*. 2005. Complete collection data for the 12 species of Hawaiian picture-wing flies. Compiled from the Hawaiian *Drosophila* Database Project. Excel program file format. 16 pp.

Kaneshiro, K. *in litt.* 2006. Conversation between Ken Kaneshiro and staff of Pacific Islands Fish and Wildlife Office, U.S. Fish and Wildlife Service regarding *Drosophila differens*, *Drosophila musaphilia*, and *Drosophila neoclavisetae*. March 10, 2006.

Magnacca, K. *in litt.* 2010. Army environmental sites collecting report. Puu Hapapa, February 23-25, 2010. Submitted by Karl Magnacca, Department of Biology, University of Hawaii, Hilo. 1 pp.

Magnacca, K. *in litt.* 2012a. Collection and survey data set for listed Hawaiian Drosophila from 2009 to 2011 compiled by Karl Magnacca, Research Entomologist, Division of Forestry and Wildlife and sent to Diane Sether, U.S. Fish and Wildlife Service, Honolulu, HI.

Magnacca, K. *in litt.* 2012b. Email communication between Karl Magnacca, Research Entomologist, Division of Forestry and Wildlife and Diane Sether, U.S. Fish and Wildlife Service, Honolulu, HI on May 1, 2012.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Picture-wing fly
(Drosophila obatai)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:
Diane Sether, Invertebrate Biologist
Jess Newton, Endangered Species Recovery Program Leader
Assistant Field Supervisor for Endangered Species

Approved _____ Date 8/28/2012
for **Field Supervisor, Pacific Islands Fish and Wildlife Office**