

Picture-wing fly
(Drosophila tarphytrichia)

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 tarphytrichia*)

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

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from the Hawaiian Islands Final Rule, the Recovery Outline for 12 Hawaiian picture-wing flies, current published and unpublished materials and expert opinions and knowledge on the *Drosophila tarphytrichia* species.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.

Three critical habitat units totaling 332 hectares (822 acres) have been designated for *Drosophila tarphytrichia* 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
 No

2.2 Recovery Criteria

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

Yes
 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 tarphytrichia* 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. The larvae of *Drosophila tarphytrichia* feed only within the decomposing portions of the stems and branches of *Charpentiera obovata* trees (family Amaranthaceae) in mesic forest habitat (Montgomery 1975).

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 *Drosophila tarphytrichia* 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).

Historically, *Drosophila tarphytrichia* was known from both the Koolau and the Waianae Mountains between 580 and 885 meters (1,900 and 2,900 feet) above sea level. The species is now considered to be extirpated from the Koolau range where it was originally discovered near Manoa Falls on Oahu. *Drosophila tarphytrichia*'s four mesic forest habitat sites in the Waianae Mountains include Puu Kaua, Mauna Kapu, Kaluaa Gulch, and Palikea. Only Kaluaa Gulch and Palikea were occupied during the last surveys conducted in 1972 and 1997, respectively (K. Kaneshiro, *in litt.* 2005). At the four Waianae habitat sites, a total of 31 *D. tarphytrichia* individuals were recorded on 36 different survey dates between 1965 and 1997 (K. Kaneshiro, *in litt.* 2005). *Drosophila tarphytrichia* was not observed during eight surveys conducted in the Waianae Mountains on the Honouliuli Preserve from 2009-2011 (Magnacca, *in litt.* 2012a).

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:

No changes in taxonomic classification have occurred. *Drosophila tarphytrichia* was described by Hardy (1965) from specimens collected from Manoa Falls on Oahu in 1949. This species is closely related to *Drosophila vesciseta* based on the structure of the male genitalia (Kaneshiro *et al.* 1995), but can be differentiated by distinct wing markings and the ornamentation of the front legs of the male. The thorax is almost entirely yellow to red with a tinge of brown on the top. The legs are yellow, with the tip of the front leg strongly flattened laterally and with a dense clump of black hairs. This species is 3.7 millimeters (0.15 inches) long with wings 4.0 millimeters (0.2 inches) long.

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.):

Seasonal and day-to-day variability of *Drosophila* presence and detection with baits significantly complicates assessing the range of a species. *Drosophila tarphytrichia* was first recorded in 1965 from Manoa Falls, on the island of Oahu (Hardy 1965). Found only on Oahu, *D. tarphytrichia* was historically known from the Koolau and the Waianae Mountains from 580 and 885 meters (1,900 and 2,900 feet) above sea level. Habitat is dry to mesic, lowland, *Metrosideros polymorpha* (ohia) and *Acacia koa* (koa) forest where the larval host plant, *Charpentiera obovata* (family Amaranthaceae) are found. The species is now considered to be extirpated from the Koolau range where it was originally discovered near Manoa Falls.

Drosophila tarphytrichia's four mesic forest habitat sites in the Waianae Mountains include Puu Kaua, Mauna Kapu, Kaluaa Gulch, and Palikea, the latter two of which were occupied during the last surveys there in 1972 and 1997, respectively (K. Kaneshiro, *in litt.* 2005). At the four Waianae habitat sites, a total of 31 *D. tarphytrichia* individuals were recorded on 36 different survey dates between 1965 and 1997 (K. Kaneshiro, *in litt.* 2005).

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 Endangered Species 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 conservation of the species and that may require special management or protection. The PCEs for *Drosophila tarphytrichia* are: (1) dry to mesic, lowland, ohia and koa forest between

the elevations of 524–910 meters (1,720–2,985 feet); and (2) the larval stage host plant *Charpentiera obovata*, which exhibits one or more life stages (from seedlings to senescent individuals) (USFWS 2008).

A Final Rule establishing three critical habitat units for *Drosophila tarphytrichia* went into effect January 5, 2009 (USFWS, 2008).

Drosophila tarphytrichia-Unit 1-Kaluaa Gulch consists of 213 hectares (527 acres) of diverse, mesic forest within the southern Waianae Mountains of Oahu. Ranging in elevation from 525–850 meters (1,720–2,785 feet), this unit is privately owned and is part of a larger area called the Honouliuli Preserve, administered and managed by The Nature Conservancy of Hawaii.

Drosophila tarphytrichia-Unit 2-Palikea consists of 84 hectares (208 acres) of lowland, mesic, *Metrosideros polymorpha* (ohia) and *Acacia koa* (koa) forest within the southern Waianae Mountains of Oahu. Ranging in elevation from 585–910 meters (1,920–2,985 feet), this unit is privately and State-owned, and is part of a larger area called the Honouliuli Preserve, administered and managed by The Nature Conservancy of Hawaii.

Drosophila tarphytrichia-Unit 3-Puu Kaua consists of 35 hectares (87 acres) of lowland, diverse mesic, *Metrosideros polymorpha* (ohia) and *Acacia koa* (koa) forest within the southern Waianae Mountains of Oahu. Ranging in elevation from 570–870 meters (1,865–2,855 feet), this unit is privately owned and is part of a larger area called the Honouliuli Preserve, administered and managed by The Nature Conservancy of Hawaii.

According to the most recent survey data (K. Kaneshiro, in litt. 2005), these three units were occupied by *Drosophila tarphytrichia* 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 includes populations of *Charpentiera obovata*, the larval stage host plant associated with this species.

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:

Lands with suitable habitats and that are designated as critical habitat units need management and control for feral ungulates such as pigs and goats; nonnative insects such as ants and tipulids; rats; nonnative plants; and

wildfire (Cuddihy and Stone 1990; Howarth et al 2001; Kishinami 2001; Science Panel 2005). The invasion of several nonnative plants, including species such as *Psidium cattleianum* (strawberry guava), *Lantana camara* (lantana), *Melinis minutiflora* (molasses grass), *Schinus terebinthifolius* (Christmas berry), and *Clidemia hirta* (Koster's curse), further contributes to the degradation of native forests and the host plants of picture-wing flies (Wagner *et al.* 1999; Science Panel 2005). *Psidium cattleianum*, *L. camara*, *M. minutiflora*, and *S. terebinthifolius* form dense stands, thickets, or mats that shade or outcompete native plants. *Melinis minutiflora* is a grass that increases fire risk and tends to replace native plants following fires (Smith 1985; Cuddihy and Stone 1990; Wagner *et al.* 1999), and *L. camara* produces chemicals that inhibit the growth of other plant species (Smith 1985; Wagner *et al.* 1999). *Passiflora mollissima* (banana poka) is a vine that causes damage or death to native trees by overloading the branches and also shades out native plants beneath its dense canopy cover (Wagner *et al.* 1999).

Fire threatens the picture-wing flies living in dry to mesic lowland forests on Oahu. A large factor in the alteration of Hawaiian dry and mesic regions in the past 200 years has been the increase in fire frequency, a condition to which the native flora is not adapted. The invasion of fire-adapted alien plants, especially *Melinis minutiflora*, facilitated by ungulate disturbance, has increased the susceptibility of native areas to wildfire and increased fire frequency. The impact of an altered fire regime is a serious and immediate threat to the dry and mesic habitats that support over one-third of Hawaii's threatened and endangered species, including the picture-wing flies and their host plants (Hughes *et al.* 1991; Blackmore and Vitousek 2000).

The three critical habitat units are within the Honouliuli Preserve that is administered and managed by The Nature Conservancy of Hawaii. The Nature Conservancy of Hawaii actively manages the Honouliuli Preserve to reduce the threats posed by nonnative plants, wildfire, and ungulate damage.

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 by nonnative insects and other arthropods poses a grave threat to Hawaii's native *Drosophila*, through direct predation or possibly parasitism as well as competition for food or space (Howarth and Medeiros 1989; Howarth and Ramsay 1991; Howarth et al. 2001; Kishinami 2001). *Drosophila tarphytrichia* flies at all life stages, face

substantial predation pressure from nonnative insects such as ants. The *D. tarphytrichia* larval stage faces resource competition from nonnative tipulid flies (crane flies, family Tipulidae) which also feed within the decomposing bark of *Charpentiera obovata* (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.

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 *Charpentiera* sp. may be 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

Hawaii picture-wing fly, *Drosophila tarphytrichia*, is an endangered endemic species found only on the island of Oahu. *Drosophila tarphytrichia* is restricted to the natural distribution of its host plant, *Charpentiera obovata* (family Amaranthaceae). *Drosophila tarphytrichia* larvae feed within the decomposing bark and stems of *C. obovata* hosts that are found in dry to mesic, lowland forests.

The Primary Constitutive Elements (PCE) for *Drosophila tarphytrichia* are: (1) Dry to mesic, lowland, ohia and koa forest between the elevations of 524–910

meters (1,720–2,985 feet); and (2) the larval stage host plant *Charpentiera obovata*, which exhibits one or more life stages (from seedlings to senescent individuals). On January 5, 2009, the Final Rule establishing critical habitat (CH) for *D. tarphytrichia* went into effect. Three CH units totaling 332 hectares (822 acres) have been designated for *D. tarphytrichia* on the island of Oahu.

According to the most recent survey data these CH units was occupied by the species at the time of listing. The CH Units are on the Honouliulu Preserve. The Honouliulu Preserve is administered and managed by The Nature Conservancy of Hawaii. The Nature Conservancy of Hawaii’s management measures include reducing the risk of wildfire and ungulate damage.

Current threats to *Drosophila tarphytrichia* include feral ungulates such as goats and pigs; ants, tipulids, and other nonnative insects; rats; invasive plants; and wildfire. Lands with suitable habitats and those 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. tarphytrichia* and the range of its host plants. A draft recovery plan for this species is being developed.

No observations of *Drosophila tarphytrichia* been reported from eight surveys conducted since the species was listed as endangered under the Endangered Species Act. *Drosophila tarphytrichia* is considered extirpated from the Koolau Mountains, a portion of its historic range. Although some management is occurring, most threats are not being managed throughout the species range. Therefore, *D. tarphytrichia* 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

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 the habitat of *Drosophila tarphytrichia* and its larval plant host, *Charpentiera obovata*, and control fire, rat, nonnative insect, and ungulate threats.
3. Eliminate or manage nonnative plants that compete with *Charpentiera obovata* and increase wildfire risk.
4. Survey and document predatory threats.
5. Develop and implement a systematic *Drosophila tarphytrichia* survey and monitoring plan that includes historic habitats and other suitable habitats.
6. Evaluate the need to re-establish or supplement *Charpentiera obovata* and *Drosophila tarphytrichia* populations within their historical range.

5.0 REFERENCES

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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, Hawaii.

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 tarphytrichia*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- 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 Jess Newton Date 8/28/2012
for Field Supervisor, Pacific Islands Fish and Wildlife Office