

## **5-YEAR REVIEW**

Short Form Summary

**Species Reviewed:** Picture-wing Fly  
(*Drosophila differens*)

**Current Classification:** Endangered

### **Federal Register Notice announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawai‘i, Oregon, Washington, Montana, and Idaho. Federal Register 81(29): 7571–7573.

### **Lead Region/Field Office:**

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

### **Name of Reviewer(s):**

Diane Sether, Ph.D., Wildlife Biologist, Maui Nui and Hawai‘i Island Geographic Team, PIFWO

Megan Laut, Animal Recovery Coordinator, PIFWO

Gregory Koob, Conservation and Restoration Team Manager, PIFWO

### **Methodology used to complete this 5-year review:**

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service. The review was based on a review of current, available information since the last 5-year review for *Drosophila differens* (USFWS 2012). The evaluation by the Wildlife Biologist was reviewed by the Animal Recovery Coordinator and Conservation and Restoration Team Manager.

### **Background:**

For information regarding the species listing history and other facts, please refer to the U.S. Fish and Wildlife Service’s Environmental Conservation On-line System (ECOS) database for threatened and endangered species ([http://ecos.fws.gov/tess\\_public](http://ecos.fws.gov/tess_public)).

### **Review Analysis:**

Please refer to the previous 5-year review for *Drosophila differens* published on August 28, 2012 (available at [https://ecos.fws.gov/docs/five\\_year\\_review/doc4102.pdf](https://ecos.fws.gov/docs/five_year_review/doc4102.pdf)), for a complete review of the species’ status, threats, and management efforts. No significant information regarding the species’ biological status has come to light since listing to warrant a change in the Federal listing status of *D. differens*.

This picture-wing fly is an endangered endemic species found only on the island of Moloka‘i. The current status and trends for *Drosophila differens* are provided in the tables below.

New status information:

No new status information.

#### New Threat:

- Effects due to climate change may pose a threat to the larval hosts of this species. Fortini *et al.* (2013) conducted a landscape-based assessment of climate change (moving climate envelope) vulnerability for native plants of Hawai‘i using high resolution climate change projections. Climate change vulnerability is defined as the relative inability of a species to display the possible responses necessary for persistence under climate change (changes in rainfall and temperatures). The assessment by Fortini *et al.* (2013) was conducted for *Clermontia arborescens*, *C. grandiflora*, *C. kakeana*, *C. oblongifolia*, and *C. pallida* at the species level, and concluded that these *Drosophila differens* larval host species are vulnerable to the impacts of climate change, with vulnerability scores of 0.367, 0.365, 0.315, 0.329, and 0.733, respectively (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions are needed to conserve these picture wing fly larval host species.

#### New management actions:

Actions specifically for *Drosophila differens* have not been implemented, but habitat management (fencing and ungulate control) within its range and recovery actions for *D. differens*’ host plants (surveys, genetic storage, and outplanting), which are also endangered, directly or indirectly benefit *D. differens*.

#### Synthesis:

Since the 5-year review in 2012, no new information on the status of *Drosophila differens* has been collected. There has been no *D. differens* monitoring or survey efforts in recent years, and no management efforts specifically for *D. differens* have been implemented. Efforts to prevent introduction of invasive plant disease such as rapid ‘ōhi‘a death, and alien predators, such as coqui frog (*Eleutherodactylus coqui*) to Moloka‘i, and protection and management of the wet *Metrosideros polymorpha* (‘ōhi‘a) forest in the historical range of the picture-wing fly are carried out largely by non-profit groups. Seed collection, storage, and reintroduction of *Clermontia* spp., the hosts of the picture wing fly, in the historical range of *D. differens* have been successful.

A draft recovery outline that included *Drosophila differens* was published in August 2006. With no final recovery plan for *D. differens*, recovery criteria and goals have not been identified for this species. The current distribution of this picture-wing fly is not known because of the lack of surveys conducted. Threats identified in the final listing rule and draft recovery outline are not sufficiently managed throughout the range of the species (Table 2). Therefore, *D. differens* meets the definition of endangered as it remains in danger of extinction throughout its range.

#### Recommendations for Future Actions:

- Survey and inventory - develop and implement a systematic *Drosophila differens* survey and monitoring plan that includes historic habitats and other suitable habitats on Moloka‘i.
- Develop and implement a Recovery Plan.

- Ungulate monitoring and control
  - Construct and maintain fenced exclosures to protect all *Drosophila differens* life stages and host plants from the negative impacts of feral ungulates.
  - Monitor fenced areas to maintain absence of ungulates.
- Invasive plant monitoring and control – control established ecosystem-altering nonnative invasive plant species around *Clermontia* spp. and *Drosophila differens* habitat.
- Captive rearing and reintroduction – evaluate the need to develop and implement a captive rearing and reintroduction program for *Drosophila differens* in its historic range.
- Climate change adaptation strategy – research the suitability of habitat for reintroducing or translocating this species and its host plants in the future due to the impacts of climate change.
- Predator, herbivore, and disease monitoring and control – implement effective control methods for fire, rat, nonnative insect predators, habitat altering plant disease, and coqui frogs within the vicinity of *Drosophila differens* and *Clermontia* spp. host plant populations.
- Stochastic events – build resilience and redundancy – increase numbers of populations and individuals scattered through the historic range to reduce impacts from low numbers.
- Habitat and natural process protection, management, and restoration –
  - Protect, manage and restore *Clermontia* spp. that can serve as hosts of *Drosophila differens* within their historical range.
  - Improve monitoring and biosecurity measures to prevent introductions of alien species to Moloka‘i.
  - Develop and implement inspection and quarantine measures for Moloka‘i.
- Population biology research – Conduct biological and ecological research on *Drosophila differens*.
- Alliance and partnership development – Revisit with Moloka‘i watershed partnerships and other stake holders for host plant management and invasive plant, insect and mammal control.
- Outreach and Education – Develop and implement a public information program.

**Table 1. Status and trends of *Drosophila differens* from listing through current 5-year review.**

Date	No. wild individuals	No. released	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria completed?
2006 (listing)	No recent sightings	0	Not yet established	No
2006 (Draft Recovery Outline)	No recent sightings	0	Not yet established	No
2008 (critical habitat)	No recent sightings	0	Not yet established	No
2012 (5-year review)	No recent sightings	0	Not yet established	No
2018 (5-year review)	No recent sightings	0	Not yet established	No

**Table 2. Threats to *Drosophila differens* and ongoing conservation efforts.**

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial. Several sites where <i>Drosophila differens</i> has been documented have been fenced and ungulates removed. Monitoring is conducted to maintain zero ungulate presence. Fencing of an additional site is planned.
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial. The Nature Conservancy staff continues to remove and eradicate ecosystem altering invasive plant species from the Kamakou Preserve where <i>Drosophila differens</i> has been documented. Understory monitoring is conducted every 6 years to evaluate forest health.
Effects due to climate change	A, E	Increasing	No
Rodent predation or herbivory degradation of habitat	C	Ongoing	No. The seeds, bark, and flowers of <i>Clermontia</i> spp., the hosts of <i>Drosophila differens</i> , are susceptible to herbivory by all the rat species. To manage this threat, thousands of <i>Clermontia</i> spp. seeds are in genetic storage.
Alien predators – Invertebrates	C	Ongoing	No. <i>Drosophila differens</i> face substantial predation pressure from nonnative insects such as yellowjacket wasps ( <i>Vespula germanica</i> ).
Lack of adequate biosecurity legislation and regulations	D	Ongoing	No. Molokai‘i does not have a biosecurity program in place to prevent introduction of invasive species, such as coqui frog (Beard 2007, Beard et al 2009, Bernard and Mautz. 2016), or ecosystem altering plant diseases such as rapid ‘ohia death (University of Hawai‘i, College of Tropical Agriculture and Human Resources. 2018).
Alien Competitors	D, E	Ongoing	No. <i>Drosophila differens</i> larval stage, faces resource competition from nonnative tipulid flies (crane flies, family Tipulidae) which also feed within the decomposing bark of <i>Clermontia</i> spp. (Science Panel 2005). Existing regulations offer inadequate protection to these species from the introduction of nonnative insects and the loss of their host plants.
Human Disturbance	E	Ongoing	Partial: Education of personnel on Molokai continues.
Environmental Catastrophes	E	Ongoing	No
Stochastic events— Reduced viability	E	Ongoing	No. No surveys have been reported for <i>Drosophila differens</i> since 2005 so no current population or distribution is

Threat	Listing factor	Current Status	Conservation/ Management Efforts
due to low numbers			known. No <i>Drosophila differens</i> are in captive rearing.

**References:**

See previous 5-year review completed in 2012 for a more complete list of references (USFWS 2012). Only references not included in that document are provided below.

Beard, K.H. 2007. Diet of the invasive frog, *Eleutherodactylus coqui*, in Hawaii. *Copeia* 2007:281-291.

Beard, K.H., E.A. Price, and W.C. Pitt. 2009. Biology and impacts of Pacific island invasive species 5. *Eleutherodactylus coqui*, the coqui frog (Anura: Lepodactylidae). *Pacific Science* 63: 297–316.

Bernard, R.F. and W.J. Mautz. 2016. Dietary overlap between the invasive coqui frog (*Eleutherodactylus coqui*) and the Hawaiian hoary bat (*Lasiurus cinereus semotus*) on the island of Hawai‘i. *Biological Invasions* 18: 3409–3418.

Fortini, L., J. Price, J. Jacobi, A. Vorsino, J. Burgett, K. Brinck, F. Amidon, S. Miller, S. Gon II, G. Koob, and E. Paxton. 2013. A landscape-based assessment of climate change vulnerability for all native Hawaiian plants. Technical report HCSU-044. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 134 pp.

[PEPP] Plant Extinction Prevention Program 2017. Statewide species totals *ex situ*, Excel table.

University of Hawai‘i, College of Tropical Agriculture and Human Resources. 2018. Rapid ‘Ohia Death Website. <https://cms.ctahr.hawaii.edu/rod/HOME.aspx> Last accessed March 24, 2018.

[USFWS] U.S. Fish and Wildlife Service. 2012. Picture-wing Fly (*Drosophila differens*) 5-year Review Summary and Evaluation. U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i. 16 pp.

[USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawai‘i, Oregon, Washington, Montana, and Idaho. *Federal Register* 81(29): 7571-7573.

**U.S. FISH AND WILDLIFE SERVICE**  
SIGNATURE PAGE for 5-YEAR REVIEW of  
Picture-wing Fly (*Drosophila differens*)

**Pre-1996 DPS listing still considered a listable entity?** N/A

**Recommendation resulting from the 5-year review:**

- Delisting
- Reclassify from Endangered to Threatened status
- Reclassify from Threatened to Endangered status
- No Change in listing status

For  
**Field Supervisor, Pacific Islands Fish and Wildlife Office**