5-YEAR REVIEW

Species Reviewed: Hawaiian picture-wing fly (*Drosophila digressa*)
Current Classification: Endangered

Federal Register Notice announcing initiation of this review:
[USFWS] U.S. Fish and Wildlife Service. 2023. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews for 133 species in Oregon, Washington, Idaho, Montana, California, Nevada, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 88(56):17611–17614.

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

Name of Reviewer:
Diane Sether, Ph.D., Invertebrate and Wildlife Biologist
John Vetter, Animal Recovery Coordinator, PIFWO
Megan Laut, Conservation & 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 of the U.S. Fish and Wildlife Service (USFWS) beginning in February 2025. The review was based on a review of current, available information since the last 5-year review for *Drosophila digressa* (USFWS 2020, entire). The evaluation by Diane Sether, PhD., Invertebrate and Wildlife Biologist, was reviewed by John Vetter, Animal Recovery Coordinator, and Megan Laut, Recovery Program Manager.

Background:
For information regarding the species' listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species at https://ecos.fws.gov/ecp/species/1543.

Review Analysis:
Please refer to the Recovery Plan for 15 Species from the Island of Hawai‘i (USFWS 2023, entire), the Recovery Implementation Strategy for 15 species from the Island of Hawai‘i (USFWS 2025b, entire), the Species report for *Drosophila digressa* (Picture-wing fly) (USFWS 2023c), critical habitat designation (USFWS 2024, entire), and the previous 5-year review for *Drosophila digressa* signed August 4, 2020 (available at https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3026.pdf)for a complete review of the species' status, threats, management efforts, and references cited. Since the last 5-year review and recovery plan, critical habitat for the species was finalized. We are not aware of any significant new information regarding the species' biological status since listing to warrant a change in the Federal listing status of *D. digressa* as endangered.

Drosophila digressa, in the family Drosophilidae, is a picture-wing fly endemic to the mesic forest and montane wet habitats of the island of Hawai‘i. Historically known from

five populations, surveys conducted in 2009 and 2010, and in 2022, found the species in only three locations on the island of Hawai‘i (Magnacca 2022a, entire; USFWS 2023c pp. 30–32; Magnacca and Matsumoto 2025 pers. comm., entire). One population occurs in the Olopua Kīpuka fenced exclosure in the mesic montane habitat of the Manukā Natural Area Reserve. The second population occurs in montane wet habitat of ‘Ōla‘a Forest within Hawai‘i Volcanoes National Park. A third population is present in the Honomalino Forest Reserve. The number of individuals at each of these locations is unknown. Adult flies are generalist microbivores (microbe eating) and feed upon a variety of decomposing plant material. This picture-wing fly may breed throughout the year, but egg laying generally increases following the rainy season. The female lays her eggs only in stems and bark of decaying *Charpentiera* spp., (pāpala) and *Ceodes brunoniana* (pāpala kēpau [previously known as *Pisonia brunoniana*]), and *Rockia sandwicensis* (‘aulu, pāpala kēpau [previously known as *Pisonia sandwicensis*]) (Magnacca 2012 in litt., entire; Rossetto and Caraballo-Ortiz 2020, entire; Magnacca 2023 in litt., entire).

New Status Information:

- Critical habitat was proposed for *Drosophila digressa* on March 29, 2023 and finalized March 12, 2024 (USFWS 2024, entire; Table 1).

Table 1. Critical habitat units designated for *Drosophila digressa* on the island of Hawai‘i.

Unit	Unit Description	Unit Occupied
Unit 1	Consists of 15,714 acres of wet forest ecosystem from ‘Ō‘ōkala to Maulua Nui on the northeastern slope of Mauna Kea	No
Unit 2	Consists of 31,998 acres of wet forest ecosystem from ‘Ōla‘a to Upper Waiākea on the eastern slope of Mauna Loa and partially on the northern slope of Kīlauea Volcano	Yes
Unit 3	Consists of 8,781 acres of wet and mesic forest ecosystems at Kahuku on the southern slopes of Mauna Loa	No
Unit 4	Consists of 167 acres of mesic forest ecosystem at Manukā on the southern slopes of Mauna Loa	Yes
Unit 5	Consists of 3,412 acres of wet forest ecosystem from	No

	Kīpāhoehoe to Honomalino on the southwestern slopes of Mauna Loa	
Unit 6	Consists of 224 acres of wet forest ecosystem from Miloli‘i to Honomalino on the southwestern slopes of Mauna Loa	Yes
Unit 7	Consists of 1,346 acres of wet forest ecosystem from Kukuiopa‘e to ‘Ōlelomoana on the southwestern slopes of Mauna Loa	No
Unit 8	Consists of 661 acres of wet forest ecosystem in Ka‘ohe on the southwestern slopes of Mauna Loa	No
Unit 9	Consists of 1,906 acres of wet forest ecosystem in Ho‘okena on the southwestern slopes of Mauna Loa	No

- In June 2022, *Drosophila digressa* was observed in the Honomalino Forest Reserve, just north of Manukā Natural Area Reserve, at an elevation of 2,749 ft (835 m). According to Magnacca (2022a, p. 2; Magnacca 2025 in litt., p. 1), at least 20 individuals were observed feeding on the decaying trunk of a *Charpentiera* tree trunk. Many eggs were also visible in the bark. The tree, though still living, was rotting after apparent damage from a treefall. This was the only *Charpentiera* observed in this forest, which occured in a small patch dominated by dense *Rockia sandwicensis* (‘aulu) surrounded by open, nonnative forest (Magnacca 2022a, p. 2). *Rockia sandwicensis* is a host of *D. digressa* but it is unclear if *D. digressa* can persist on that tree species only (Magnacca 2025 in litt., p. 1). Additional *D. digressa* populations may occur in this forest, but the forest has not been extensively explored because of the difficult terrain.

- *Drosophila digressa* is believed to be extant in low numbers at the ‘Ōla‘a Forest within Hawai‘i Volcanoes National Park, and possibly extant at the Olopua Kīpuka fenced exclosure at Manukā Natural Area Reserve in small pockets that provide adequate host substrate and humidity (Magnacca 2012 in litt., entire; USFWS 2023c, p. 32). It is also possible that small populations of the picture-wing fly exist in areas on private land that may have existing populations of *Charpentiera* species, but no surveys have been conducted in those areas. This picture-wing fly species is not currently in captivity (Magnacca and Matsunaga 2025 pers. comm., entire).

- Little is known about the demographics or rate of mating encounter at the three sites where the species was last observed. The current population size or distribution of *Drosophila digressa* throughout its historical or suitable range is unknown.

New Threats:

- Drought continues to be a threat to *Drosophila digressa*. *Metrosideros polymorpha* (ʻōhiʻa) is an important overstory tree in the mesic montane and wet montane habitats of this picture-wing fly. The tall ʻōhiʻa trees intercept fog, contributing largely to the water supply of the plant community. Most of the historical mesic and wet montane habitats of *D. digressa* have experienced prolonged periods of abnormally dry to extreme drought conditions for the past 20 to 35 years (NIDIS 2025, entire). According to Magnacca (2012 in litt., entire) almost the entire ʻōhiʻa canopy at the Manukā Natural Area Reserve has died over the past 20 to 30 years due to the prolonged drought. This has resulted in overall habitat degradation and appears to alter decay processes of the picture-wing fly host plants (Magnacca and Matsunaga 2025 pers. comm., entire). Drought also alters the entire plant community on which the fly depends. Although *Rockia sandwicensis* experienced a growth spurt due to increase in sunlight caused from the ʻōhiʻa dieback, this increase in *R. sandwicensis* seedlings and juveniles is unlikely to be sustained over time. Should the *R. sandwicensis* plants survive to maturity, it is unlikely the much drier habitat conditions will be suitable to support the picture-wing fly (Magnacca 2012 in litt., entire).

- Rapid ʻōhiʻa death (ROD) has devastated ʻōhiʻa, an important canopy tree in the mesic and wet montane habitats of *Drosophila digressa* (Barnes et al., 2018, entire; Friday et al., 2020, entire; Heller et al., 2019, entire). This lethal fungal-caused disease of ʻōhiʻa currently exists in or near the historical and known areas supporting *D. digressa* understory habitats (CTAHR 2025, Hawaiʻi Island Figure). Like drought, the loss of canopy allows more sunlight to reach the forest floor increasing the temperature and lowering the humidity, subsequently causing adverse effects on the picture wing fly and its habitat (Magnacca and Matsunaga 2025 pers. comm., entire)

- Nonnative feral ungulates continue to pose a threat to *Drosophila digressa* through destruction and degradation of the species' habitat and herbivory of its host plants (Magnacca 2022a, pp. 2–3; Magnacca 2022b, p. 4; Magnacca 2025 in litt., entire; Magnacca and Matsunaga 2025 pers. comm., entire). Pigs are abundant and widespread in the Honomalino Forest Reserve, encouraging the growth of weeds over native vegetation (Magnacca 2022a, p. 1). The unique lower elevation remnant forests of ʻolopua (*Notelaea* [Nestegis] *sandwicensis*) and ʻaulu need protection from ungulate damage in order to maintain sustainable populations of the picture-winged fly and its plant hosts (Magnacca 2022 p. 1–3).

- Endemic Hymenopteran parasitoids (family Figitidae) known to parasitize flies, including *Drosophila* spp., were observed during surveys at Kukuiopa‘e in the DOFAW-managed South Kona Forest Reserve (Magnacca in litt., 2022b, p. 3). Of the 12 species observed, all but one are apparently undescribed. The specific habits of the Figitid parasitoids are unknown (Magnacca 2022b in litt., p. 3; Magnacca and Matsunaga 2025 pers. comm., entire). Currently, the risk to *Drosophila digressa* is unknown. Kukuiopa‘e is part of the *Drosophila digressa* critical habitat Unit 7, though it is believed to be unoccupied at this time (USFWS 2024, entire).

- Changes in environmental conditions that may result from global climate change include increasing temperatures, decreasing precipitation, and increasing storm intensities. The habitats of *Drosophila digressa* are likely to be affected by changes in temperature, humidity, precipitation and the frequency and severity of storms (Clark et al. 2020, entire; Magnacca and Matsunaga 2025 pers. comm., entire). These stressors may change the habitats on Hawai‘i and exacerbate other threats making the habitats unsuitable for the *D. digressa*, its host plants, or both. 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).

- Low number of individuals continues to threaten *Drosophila digressa.* The species was observed in 2009 and 2010 at only two of its five historically known locations (Magnacca 2010 in litt., entire) and in 2022 at a third location that is surrounded by open and invasive plant degraded forest (Magnacca 2022, entire; USFWS 2023, entire; Magnacca 2025 in litt., entire; Magnacca and Matsumoto 2025 pers. comm., entire). Because of limited numbers of individuals and only three known populations, a single catastrophic event (e.g., hurricane, drought) may result in extirpation of the extant population and extinction of this species. Species with few known locations, such as *Drosophila digressa,* are less resilient to threats that might otherwise have a relatively minor impact on widely distributed species.

- Isolation and limited existence of *Charpentiera* threatens the existence of *Drosophila digressa*. Though *D. digressa* can apparently survive on *Rockia sandwicensis* and *Ceodes brunoniana*, as evidenced by its persistence in ‘Ōla‘a where only *C. brunoniana* is present, *D. digressa* appears to prefer *Charpentiera* species (Magnacca 2022, p. 3). Based on surveys in the Honomalino Forest Reserve by Magnacca (2022a, entire), the only *Charpentiera* tree seen was attracting large numbers of these flies, but only because a large portion of it was rotting and bleeding sap. Some *Charpentiera* trees can be found to the southeast at Manukā, but apparently only in pit craters (Magnacca 2022, p. 3). This host plant isolation poses a significant barrier to *D. digressa* breeding and survival. Maintaining and restoring *Charpentiera* should be part of vegetation management (Magnacca 2022, p. 3).

New Management Actions:

- Outplanting— Maintaining and restoring *Charpentiera* should be part of vegetation management for the Honomalino Forest Reserve (Magnacca 2022, p. 3) and throughout the nine *Drosophila digressa* critical habitat units, which include the three known populations of *D. digressa*.

Table 2. Known populations of *Drosophila digressa* from listing to this 5-year review.

Date	No. Populations	No. Individuals	Downlisting Recovery Criteria	Downlisting Criteria Completed?
2013 listing	≥5	unknown	N/A	N/A
2019 recovery outline	≥5	unknown	N/A	N/A
2020 5-year review	≥3	unknown	N/A	N/A
2023 species report	≥3	unknown	N/A	N/A
2023 recovery plan	≥3	unknown	At least five populations with stable population indices are distributed throughout the species range; all units of designated critical habitat occupied by at least one population.	No
			A captive rearing program is established to support reestablishment in historical and suitable range.	No
			Each picture-wing fly population site in the Downlisting Criterion has viable populations of appropriate host plant species.	No
			Threats to suitable habitats supporting Downlisting Criterion are	No

			managed and afforded land protections to ensure long-term persistence of each species.	
			All major threats to individuals and populations supporting Downlisting Criterion are managed; monitoring and management plans are completed and implemented for each species; measures are in place to prevent introduction of new threats to host plants.	No
2024 critical habitat designated	≥3	unknown	At least five populations with stable population indices are distributed throughout the species range; all units of designated critical habitat occupied by at least one population.	No
			A captive rearing program is established to support reestablishment in historical and suitable range.	No
			Each picture-wing fly population site in the Downlisting Criterion has viable populations of appropriate host plant species.	No
			Threats to suitable	No

			habitats supporting Downlisting Criterion are managed and afforded land protections to ensure long-term persistence of each species.	
			All major threats to individuals and populations supporting Downlisting Criterion are managed; monitoring and management plans are completed and implemented for each species; measures are in place to prevent introduction of new threats to host plants.	No
2025 recovery implementation strategy	≥3	unknown	At least five populations with stable population indices are distributed throughout the species range; all units of designated critical habitat occupied by at least one population.	No
			A captive rearing program is established to support reestablishment in historical and suitable range.	No
			Each picture-wing fly population site in the Downlisting Criterion has viable populations of	No

			appropriate host plant species.	
			Threats to suitable habitats supporting Downlisting Criterion are managed and afforded land protections to ensure long-term persistence of each species.	No
			All major threats to individuals and populations supporting Downlisting Criterion are managed; monitoring and management plans are completed and implemented for each species; measures are in place to prevent introduction of new threats to host plants.	No
2025 5-year review	≥3	unknown	At least five populations with stable population indices are distributed throughout the species range; all units of designated critical habitat occupied by at least one population.	No
			A captive rearing program is established to support reestablishment in historical and suitable range.	No
			Each picture-wing fly population site in	No

			the Downlisting Criterion has viable populations of appropriate host plant species.	
			Threats to suitable habitats supporting Downlisting Criterion are managed and afforded land protections to ensure long-term persistence of each species.	No
			All major threats to individuals and populations supporting Downlisting Criterion are managed; monitoring and management plans are completed and implemented for each species; measures are in place to prevent introduction of new threats to host plants.	No

Table 3. Status of threats to *Drosophila digressa* and ongoing conservation efforts.

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Ungulates	A	Ongoing	Partial—some strategic fencing is in place at the ʻŌlaʻa Small Tract of Hawaii Volcanoes National Park and the Manukā Natural Area Reserve sites where the species is most recently known; some strategic fencing is being installed in upper Kukuiopaʻe (critical habitat unit 7) above 3,200 ft (975 m), but this is a long-term project and will take years for ungulate removal. Removal of mouflon, goats, cattle, and pigs should be a priority.

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Invasive nonnative plants	A	Ongoing	None
Fire	A	Ongoing	Partial—general fire management plans are in place for Hawai‘i Volcanoes National Park, State Forest Reserves and Natural Area Reserves, but fire load is an ongoing issue
Stochastic events (drought, hurricane)	A	Ongoing	None
Altered decay cycle of host plants	A	Ongoing	None
Predation by wasps	C	Ongoing	None
Predation by ants	C	Ongoing	None
Parasitization by nonnative wasps	C	Ongoing	None
Inadequate existing regulatory mechanisms	D	Ongoing	Partial—restrictions on transport of invasive species to the island are insufficient to prevent introduction of invasive species and diseases; regulatory mechanisms are inadequate to address threats of ungulate destruction of *Drosophila digressa* habitat
Habitat altering plant disease	E	Ongoing	None
Loss of plant hosts	E	Ongoing	None
Rats	E	Ongoing	None
Limited numbers	E	Ongoing	None
Competition from flies	E	Ongoing	None
Climate change	E	Ongoing	None

Synthesis:
Drosophila digressa, a species of picture-wing fly, is a member of the family Drosophilidae (Order Diptera). The species is historically known from five locations, ranging in elevation from approximately 2,000 to 4,500 feet (ft) (610 to 1,370 meters [m]) in the mesic forest and montane wet habitats on the island of Hawai‘i. In 2009 and 2010, the species was known from only two locations: one population in the mesic habitat located in the Manukā Natural Area Reserve and a second population in the montane wet habitat of the ‘Ōla‘a Forest within Hawai‘i Volcanoes National Park. In 2022, a third population of *D. digressa* was discovered in Honomalino Forest Reserve, just north of Manukā.

The female lays her eggs only in stems and bark of decaying *Charpentiera* spp., *Ceodes*

brunoniana, and *Rockia sandwicensis* (Magnacca 2012 in litt., entire; Rossetto and Caraballo-Ortiz 2020, entire; Magnacca 2023 in litt., entire). *Rockia sandwicensis* is a host of *Drosophila digressa*, but it is unclear if *D. digressa* can persist on that tree species only (Magnacca 2025 in litt., p. 1). The preferred host plants of *D. digressa*, *Charpentiera* trees, are decreasing throughout their range due to damage from ungulates in unfenced areas and habitat degradation caused by drought and ROD changing the overstory, which results in reduced humidity.

Drosophila digressa is threatened by predation from nonnative invertebrates such as the western yellowjacket wasps (*Vespula pensylvanica*), ants, and competition for resources from limoniid crane flies. The species is also threatened by factors that harm or alter the decay cycle of its host plants and degrade its habitat. These threats include browsing by feral and domestic cattle (*Bos taurus*), feral pigs (*Sus scrofa*), mouflon sheep (*Ovis gmelini musimon*), and goats (*Capra hircus*), drought, invasive nonnative plants, plant disease that alters the canopy, fire, and hurricanes. The limited number of populations makes the species vulnerable to catastrophic events, such as hurricanes or fire. Isolation and scarcity of *Charpentiera* trees in the correct degree of decay further impedes breeding success of *D. digressa*. Together, these threats can reduce adult fitness, fecundity, and lifespan of the species. *Drosophila digressa* is not currently in captive rearing at the time of this review, but the species has previously been reared successfully in captivity.

In summary, the primary factors that pose serious and ongoing threats to the species, its plant hosts and its habitat range continue to include the following: habitat degradation and destruction; nonnative ungulates, primarily mouflon, goats, cattle, and pigs; invasive plants; drought; fire; predation; parasitization; competition for breeding resources; inadequate regulatory mechanisms to address nonnative species; natural disasters; limited numbers of populations and individuals; potential environmental changes, and the interaction of these threats. *Drosophila digressa* has not met the criteria for downlisting (Table 2) and many of the threats are currently unmanaged (Table 3); thus the species continues to meet the definition of endangered throughout its range.

Recommendations for Future Actions:

- Construct and maintain fenced exclosures to protect host plants of *Drosophila digressa* from the negative impacts of feral ungulates.
- Control feral ungulates that threaten *Drosophila digressa* and its hosts throughout the picture-wing flies‘ habitat.
- Conduct surveys for extant populations throughout the historically known range and new areas that may be suitable for *Drosophila digressa.*
- Establish a captive rearing program for *Drosophila digressa*.
- Monitor and assess abundance of individuals and growth trend of populations.
- Identify and prepare suitable habitats for translocation of picture-wing flies.
- Outplant populations of *Drosophila digressa* host plants in suitable habitats that can support the plant host and the picture-wing fly.
- Increase numbers of populations and individuals in suitable habitat through translocation to build resilient populations with redundancy and representation.

- Develop and implement fire management plans for all populations of *Drosophila digressa* and its habitat.
- Control invasive, nonnative plant species that compete with the host plants in *Drosophila digressa* habitats.
- Evaluate the distribution and impact of nonnative parasitic wasps on *Drosophila digressa*.
- Develop and implement effective control methods for rats in the *Drosophila digressa* and host plant habitats.
- Develop and implement effective control methods for nonnative wasps at all *Drosophila digressa* and host plant populations.
- Develop and implement effective control methods for ants at all *Drosophila digressa* and host plant populations.
- Develop and implement effective control methods for crane flies at all *Drosophila digressa* and host plant populations.
- Control any new threats to *Drosophila digressa* before they become widespread.
- Develop fine-scale climate models to identify future suitable habitat based on existing and historical distributions and determine potential future climate conditions.
- Identify, develop, and support alliances and partnerships to plan and implement *Drosophila digressa* habitat restoration and management to benefit and recover the species.

References:
See previous 5-year reviews for a full list of references.

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In Litteris

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Personal Communication

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of
***Drosophila digressa* (Hawaiian picture-wing fly)**

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
__X__ No Change in listing status

Name of Reviewer:

Diane Sether, Ph.D., Invertebrate and Wildlife Biologist, PIFWO
John Vetter, Animal Recovery Coordinator, PIFWO
Megan Laut, Recovery Team Manager, PIFWO

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

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