Critical species of Odonata in the Hawaiian Islands

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Abstract

Ten species of Hawaiian Odonata are considered to be currently at risk, all of them zygopterans belonging to the endemic genus *Megalagrion*. These species and their proposed status are as follows: *M. jugorum*, endemic to Maui and Lanai [CR, possibly EX]; *M. leptodemas*, endemic to Oahu [CR]; *M. molokaiense*, endemic to Molokai [CE, possibly EX]; *M. nesiotes*, endemic to Hawaii and Maui [CR]; *M. nigrohamatum nigrolineatum*, endemic to Oahu [VU]; *M. oahuense*, endemic to Oahu [VU]; *M. oceanicum* endemic to Oahu [CR]; *M. pacificum*, formerly widespread in the lowlands on all high islands [EN]; *M. williamsoni*, endemic to Kauai [EN]; *M. xanthomelas*, formerly widespread in the lowlands on all high islands [VU]. Two species held on previous IUCN lists, *M. adytum* and *M. amaurodytum peles*, have been shown by recent surveys to be more locally abundant at remote sites than was previously realized, and are proposed to be dropped from the current Red List, since they are not immediately at risk.

Regional definition

The area considered here is the Hawaiin Archipelago in the north Pacific Ocean.

State of the art

Studies on taxonomy, ecology and biodiversity

Studies on the taxonomy and distribution on Hawaiian Odonata started at the end of the 19th century. Specially R.C.L. Perkins contributed enormously to the knowledge on the Hawaiian odonatofauna; an overview of his extensive works is given by Liebherr & Polhemus (1997a, 1997b). Early comprehensive papers were published, e.g. by Alfken (1904), Perkins (1906a, 1906b) and Zimmermann (1948). Ecologically-orientated studies commenced equally early, e.g. Warren (1915a, 1915b) and Williams (1936). Recently a number of conservation-orientated papers were published, e.g. Gagné (1981), Polhemus (1994, 1995, 1996), Polhemus et al. (1999), Englund (1999, 2001) and Englund & Polhemus (2001). Jordan et al. (2003) analalyzed the molecular phylogeny and biogeography of the endemic Hawaiian genus *Megalagrion*.

Identification guides

A field identification guide for Zygoptera was prepared by Polhemus & Asquith (1996). Online color species images, distribution maps and specimen data are also available via the Bishop Museum web site.

Faunal lists

Recent faunal lists are available from Daigle (2000) and Nishida (2002), and may be accessed online at the Bishop Museum web site.

Table 1. Odonata endemic or mainly confined to Hawaii and their range of distribution in the region. DD: data deficient – might have to be deleted from list with increasing survey efforts; RR: range restricted; IC: identity of species needs clarification; A: action recommended, because of habitat destruction.

Family/species	DD	RR	IC	A	Known distribution and notes
Megalagrion					
jugorum (Perkins, 1899)	○	○	○	●	Maui, Lanai; possibly extinct
leptodemas (Perkins, 1899)	○	●	○	●	Oahu; only 4 remaining populations known
molokaiense (Perkins, 1899)	○	○	○	●	Molokai; possibly extinct
nesiotes (Perkins, 1899)	○	●	○	○	Maui, Hawaii; apparently extinct on Hawaii; only one remaining population known on Maui
nigrohamatum nigrolineatum (Perkins, 1899)	○	○	○	○	Oahu; locally abundant in certain catchments
oahuense (Blackburn, 1884)	○	○	○	○	Oahu; locally abundant on some ridges
oceanicum McLachlan, 1883	○	●	○	●	Oahu; populations severely reduced and declining
pacificum (McLachlan, 1883)	○	○	○	●	Kauai, Oahu, Maui, Molokai, Lanai, Hawaii; extirpated on Kauai, Oahu, and Lanai; rare on all other islands
williamsoni (Perkins, 1910)	○	●	○	●	Kauai; only one remaining population known
xanthomelas (Selys, 1876)	○	○	○	○	Niihau, Oahu, Molokai, Maui, Lanai, Hawaii; reduced to a single population on Oahu; populations greatly reduced on Maui; still abundant on Hawaii

Table 2. Suggested Red List categories (SRL) for critical species. CR: critically endangered; EN: endangered; VU: vulnerable.

Species	SRL	Notes
Megalagrion jugorum	CR	Possibly extinct
leptodemas	CR	
molokaiense	CR	Possibly extinct
nesiotes	CR	
nigrohamatum nigrolineatum	VU	
oahuense	VU	
oceanicum	CR	
pacificum	EN	
williamsoni	EN	
xanthomelas	VU	

Critical species

Species previously listed by IUCN

For Hawaii nine odonate species have been listed in the IUCN Red List of threatened species (IUCN 2003):

as extinct [EX]:
M. jugorum

as critically endangered [CR]:
M. amaurodytum peles

as endangered [EN]:
Megalagrion leptodemas

as vulnerable [VU]:
M. adytum, *M. nigrolineatum*, *M. oahuense*, *M. oceanicum*, *M. pacificum*

as lower risk [LR]:
M. nigrohamatum

Additionally one species was listed as priority species for Hawai by Moore (1997) as monotypic genus confined to one country only:

Nesogonia blackburni (McLachlan, 1883)

Concerning the listed species by IUCN (2003) and Moore (1997) it should be noted that:

M. amaurodytum peles (Perkins, 1899) and *M. adytum* (Perkins, 1899) —
have been shown by recent surveys to be more locally abundant at remote sites

than was previously realized, and should be dropped from the Red List, since they are not immediately at risk.

The proper nomenclatural citation for *M. nigrolineatum* — should be *M. nigrohamatum nigrolineatum*; consequently, *M. nigrohamatum* is *M. nigrohamatum nigrohamatum* (Zimmerman 1948; Polhemus & Asquith 1996).

Species to be considered

The following species should be added to the Red List based on recent survey data: *M. molokaiense* as extinct [EX]; *M. nesiotes* as critically endangered [CR]; *M. xanthomelas* as vulnerable [VU]; *M. williamsoni* as endangered [EN]. Table 1 lists all species considered to be currently at risk and gives their known distribution range, while Table 2 gives suggested Red List categories for these species.

Threats

Continuing threats to native Hawaiian Odonata, particularly members of the genus *Megalagrion*, include:

(1) introduced alien invasive fishes, particularly members of the family Poeciliidae (mosquitofishes) and various cichlids (Englund & Polhemus 1996; Englund 1999);
(2) dewatering of critical stream reaches by water diversions related to plantation agriculture and urban development (Polhemus 1994; Polhemus & Asquith 1996);
(3) degradation of stream catchments by introduced feral ungulates, particularly pigs.

Critical sites

Several sites in the Hawaiian Islands are of particular conservation priority in that they represent the locations of the last known populations for certain species:

(1) East Wailua Iki Stream, Maui – site of the only known remaining population of *Megalagrion nesiotes*. This site lies near a major highway and is under pressure by intermittent recreational use;
(2) Tripler Army Medical Center, Oahu – site of the only known remaining population of *M. xanthomelas* on Oahu. This site is threatened by continuing construction upslope and potential loss of its water source (Polhemus 1996; Englund 2001);
(3) Waiawa, North Halawa, Kahana and Maakua Streams, Oahu – sites of the last four remaining known populations of *M. leptodemas*. The latter two streams lie within the northern windward Koolau Mountains, an area that represents critical habitat for the increasingly endangered taxa *M. oceanicum* and *M. nigrohamatum nigrolineatum*. The North Halawa site lies immediately upslope of a recently constructed freeway.

Conservation priorities and recommendations

Regular monitoring of the status of known populations in order to assess their stability and trends. Enhanced protection of critical watersheds. Captive breeding and relocation/translocation of *Megalagrion xanthomelas* on Oahu.

Research priorities

Determination of agents responsible for progressive decline of stream-breeding species, particularly on the island of Oahu. Assessment of potential haplotype differences in island level populations of widespread species using molecular systematics techniques to determine the criticality of conserving individual island population units. Additional field surveys to determine if certain taxa such as *Megalagrion jugorum* and *M. molokaiense* are truly extinct, and to search for additional populations of other extremely rare species such as *M. nesiotes* and *M. leptodemas*.

Current activities

A revised monograph of the genus *Megalagrion* incorporating both morphological and molecular data is underway by Dan Polhemus & Steve Jordan. Studies of biological threats to various species, particularly in regard to introduced fishes, are underway by Ronald Englund of the Bishop Museum. Studies of life cycles and ecology for several species are underway by various workers at Hawaii Volcanoes National Park, under the guidance of David Foote.

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