

Baker River Project Terrestrial Working Group Analysis Species

Johnson's Hairstreak Butterfly (*Loranthomitoura johnsoni*)

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Habitat Type: Interior Old Growth Coniferous Forest Species

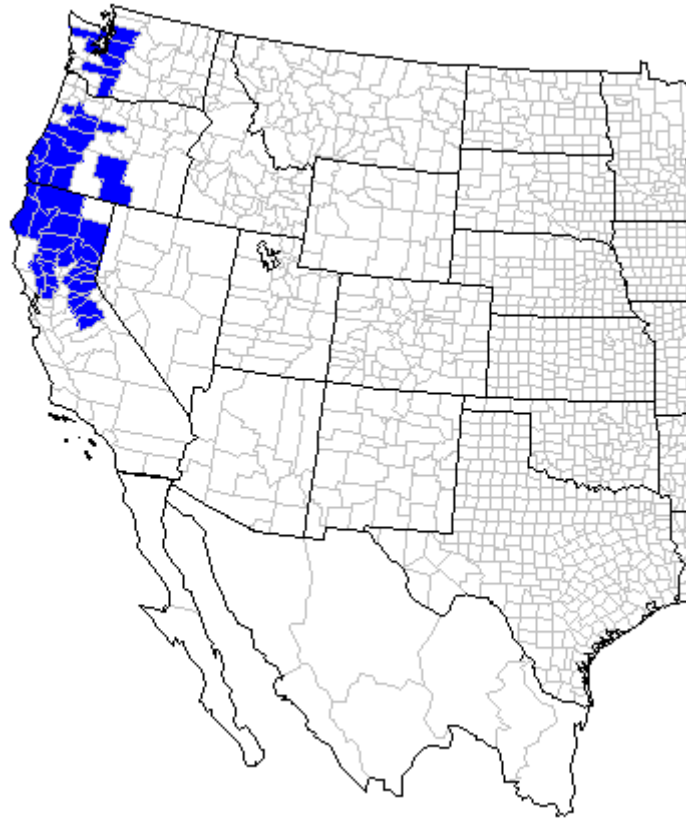
Species Biology and Population Status:

- A member of the family Lycaenidae, Johnson's hairstreak is distributed in a narrow band from southwestern British Columbia south to central California and west of the Cascade and Sierra Nevada Ranges. A group of disjunct populations also occur in Baker and Wallowa Counties in northeastern Oregon (Guppy 2001a, LaBonet *et al* 2001).
- Johnson's hairstreak was first observed in Seattle as larvae on mistletoe by the early Washington botanist and entomologist C.V. Piper (Skinner 1904) (Guppy 2001a).
- Johnson's hairstreak reaches adult stage by late May and flies till early July, during which time eggs are laid. The life cycle reaches pupation in a short time and overwinters in the pupal stage (Guppy 2001a).
- Johnson's hairstreak have an obligate diapause, meaning they must pass through hibernation before their life cycle can proceed, as a result they produce only one generation per year (Guppy 2001c).
- Johnson's hairstreak has a wingspan of 25 to 30 mm, and on average is slightly larger than most western hairstreaks (Layberry 1998).
- Although, rarely seen, large flocks have occasionally been spotted, for a short period of time, in California (Layberry 1998).
- While male butterflies need to mature for a few days after emerging from the cocoon, females will generally begin to mate during the first day after their emergence (Guppy 2001c).
- Males primarily seek out females to court and copulate with, however, females will actively search for males if they remain unmated for several days following their emergence from the cocoon. Males typically have larger eyes than female butterflies, which may provide them with better vision for locating female mates (Guppy 2001c).
- Males of territorial species will flash aggressive signals at intruders rather than engage in physical contact. Male butterflies will guard temporary territories for a few hours to a few days, leaving periodically to find food (nectar), if territories are not supplied with adequate resources. Females in search of mates will move into habitats suitable for territorial males before moving to appropriate breeding habitats (Guppy 2001c).
- Butterfly eggs are generally deposited on the larval food plant, in the case of Johnson's hairstreak, eggs are found on western dwarf mistletoe, a parasite on

- western hemlocks. Caterpillars hatching from eggs laid on the wrong food plant usually die, however, some do mature successfully and over time this mistake may evolve into use of a new food plant by a population (Guppy 2001c).
- Adult butterflies recognize and confirm the correct larval food plant by a number of stimuli, including visual recognition (i.e. leaf shape, shade of green) and chemical cues (i.e. taste and smell) as well as texture recognition. Once the plant is recognized as the correct species, eggs are deposited in specific locations on or near the plant (Guppy 2001c).
 - Butterflies are ectotherms and as such, are dependent on ambient temperatures to maintain a level of activity. Butterflies require a body temperature of 18-35°C before they are capable of flight and temperatures of 25-35°C before they are able to feed and grow at an optimal rate. In order to be fully active, body temperatures must range between 30-39°C. Butterflies bask in the sun, in various postures, to absorb radiant heat when body temperatures fall below optimum levels (Guppy 2001c).
 - Many species of butterflies experience metapopulation dynamics. Weather is often responsible for fluctuations in population abundance, closed populations in particular will tend to increase and decrease in abundance in accordance with yearly weather patterns. During especially adverse years, a species' abundance will decrease sharply over much of its range, and populations occupying less optimum habitats may be extirpated. Conversely, favorable weather conditions can initiate population booms among surviving populations followed by extensive emigrations and recolonization of vacant patches of suitable habitat (Guppy 2001c).
 - There are many sources of butterfly mortality, including adverse weather events (i.e. heavy rain, wind and hail) responsible for high mortality at any stage of the life cycle. Predators, such as ants, mites, wasps and birds, also effect butterflies at all stages of their life cycle, although the intensity of which is poorly documented. Birds are probably the most important vertebrate predator of butterfly larvae as small birds feed on eggs and young larvae, while larger birds feed on larger larvae and pupae. Adult butterflies are depredated by a wide variety of invertebrates, including dragonflies and damselflies, robberflies, ambush bugs, wasps, crab spiders and orb-weaving spiders. Birds also feed on adult butterflies, preferring brightly colored species with small wings relative to body size over those with large wings and small bodies (Guppy 2001c).
 - Many hairstreak butterflies have colored spots at the rear edge of their hindwings that resemble eyespots and long tails resembling antennae. These markings in addition to the position in which hairstreaks rest, with their head facing down, on vertical and sloped surfaces create the illusion of a “false head” to predators. Predators will attack the false head and the butterfly will then tear itself away, losing a bit of its hindwing, which has little affect on its flying ability (Guppy 2001c).
 - Many butterfly larvae are parasitized by Tachinidae, Ichneumonidae, Braconidae, and Chalcidoidea larvae (Guppy 2001c).
 - In the northern extent of its range (southwestern British Columbia), Johnson's hairstreak is endangered (Guppy 2001a).

- Johnson's hairstreak butterfly is a species of concern in westside and eastside forests and it is a state candidate species for listing in Washington State (WDFW 2000).

Johnson's Hairstreak (*Callophrys [Mitoura] johnsoni*)



Source: Nearctica.com, 2000.

Habitat Requirements:

- Johnson's hairstreak is essentially restricted to mature or old growth Douglas-fir and western hemlock stands infested with dwarf mistletoe (*Arceuthobium* spp.), which is the larval foodplant (LaBonte *et al* 2001).
- Johnson's hairstreak larvae are known to occur on mistletoes growing on western hemlock at elevations below 625 m (Guppy 2001a).
- Johnson's hairstreak is believed to occur high in the canopy, where mistletoe grows (Layberry 1998).
- Although rarely seen, most observations have been made in dense forest stands with a western hemlock component (Layberry 1998).
- Johnson's hairstreak has also been spotted flying in clearings in search of nectar sources (Layberry 1998).
- Adult male butterflies chose territories largely based on their thermoregulatory requirements. Optimum territories include sites with warm rocks, warm updrafts, and exposure to the sun both early and late in the day. Territories are also located in the vicinity of larval feeding areas and in areas that are most conspicuous to breeding females (Guppy 2001c).
- In some species, adult male butterflies will congregate on hilltops outside their normal oviposition habitat. Earlier studies speculated that this was a behavioral strategy to attract mates, however more recent evidence suggests that hilltops are probably selected as territories where encountered by chance. Regardless of the mechanism by which they are chosen, courtship and copulation will occur in hilltop territories, however, eggs are laid elsewhere. Hilltop territories are probably selected because they are well defined, and constitute only a fraction of the landscape so that detailed searches for mates can be confined to a relatively narrow portion of the population's overall area. Rare and thinly dispersed species tend to choose hilltop territories (Guppy 2001c).

Food Resources and Foraging Behavior:

- According to the current literature, Johnson's hairstreak larvae feed exclusively on all exposed parts of western dwarf mistletoe (*Arceuthobium campylopodum.*), a parasite of western hemlock (Layberry 1998, Struttman).
- As specialists, Johnson's hairstreak larvae have adapted to deal with the defenses of western dwarf mistletoe such as evolving the ability to detoxify any insecticidal chemicals it produces and to overcome any of the plant's physical barriers. In addition, the larval life cycle is closely synchronized with the seasonal growth pattern of mistletoe (Guppy 2001c).
- At the adult stage, Johnson's hairstreak feed on nectar from flowers of perennial or annual plants at ground level or on low shrubs (Guppy 2001c,d). The sugar from nectar provides the energy required by adult butterflies for body maintenance, flight and reproduction. Nectar is also an important source of water. Many small butterflies will die of dehydration within a day during hot weather when water resources are limited. Nectar is also a source of some important

- amino acids used for building proteins for both body maintenance and reproduction. Adult butterflies unable to sequester amino acids reach only about 5% of their maximum potential reproductive level. Diets with higher levels of amino acids result in larger eggs and hence larger and healthier larvae (Guppy 2001c).
- “Mud-puddling”, a common foraging behavior exhibited largely by male butterflies, often occurs where water has been contaminated by feces or urine or where natural salt licks occur in the soil. This behavior helps males replace sodium ions lost during mating with the transfer of spermatophores and other secretions to females (Guppy 2001c).

Habitat Alteration and the Effects of Human Disturbance:

- This already rare species is currently threatened by forest industry prescriptions to eradicate mistletoe and *Bacillus thuringiensis* (Bt) spraying to eliminate introduced gypsy moth (Guppy 2001a). In Oregon, species diversity and abundance of moths were significantly reduced years after Bt spraying (Guppy 2001b).
- Bt spraying may also adversely affect a number of bird and bat species that feed on butterflies or moths, as Lepidopteran numbers will be considerably depressed during the nesting season in the year of spraying. In addition, many butterfly and moth species feed on a number of forest pests that cause severe defoliation. When control species populations are reduced rapid forest defoliation may indirectly reduce fledgling success as nests become more visible and therefore vulnerable to predation (Guppy 2001b).
- Human development (i.e. housing, industrial sites, roads, hydroelectric dams, recreational sites, and agriculture) over the last century has severely altered and reduced the natural habitat of many northwestern butterfly species to the point where only species that had previously adapted to disturbed habitats have, thus far, survived with viable, long-term populations (Guppy 2001b).
- Mature hemlock forests with associated mistletoe have been severely reduced on Vancouver Island and on the adjacent mainland in the lower Fraser Valley. As a result some species, such as Johnson’s hairstreak, have been nearly extirpated from this region, granting them their current endangered status in British Columbia (Guppy 2001b).
- In Washington and Oregon, Johnson’s hairstreak butterfly is a conservation concern because of its narrow habitat requirements. In addition to forest management prescriptions to control mistletoe and forest insect pests, this rare butterfly is continually threatened by timber harvesting and uncontrolled wildfires (LaBonte *et al* 2001).
- Small and isolated populations of insects, as well as their hosts and habitats, are extremely vulnerable to small scale natural and anthropogenic disturbances, such as local succession, localized flooding, clear-cutting, controlled burns and pesticide applications. These localized events may further instigate population fragmentation and isolation (LaBonte *et al* 2001).

- Introduced grasses that have invaded native meadow and grassland habitat throughout the province of British Columbia are also responsible for declining butterfly populations and the loss of some species to this area. Weedy grasses have eliminated several native non-grass species that were important nectar sources for adult butterflies (Guppy 2001b).

Studies Conducted in the Baker River Watershed:

*** Local information still needs to be added. ***

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