WESTERN TOAD

TAXONOMY

Scientific name: *Bufo boreas* (Baird and Girard, 1852)
Common name: Western toad
Family: Bufonidae

Taxonomic comments:
Hybridizes with the red-spotted toad (*Bufo punctatus*) at Darwin Falls, Inyo County, California, and sometimes with Canadian toad (*B. hemiophrys*) in central Alberta. *B. nelsoni* was formerly included in this species.

Molecular data indicate that *B.exsul* is phylogenetically nested within *B. canorus*; further data are needed to determine whether *B. exsul* should be subsumed with *B. canorus* (Shaffer et al. 2000). "Stephens (2001) examined mitochondrial DNA from 8 Yosemite toads (selected from the samples examined by Shaffer et al. (2000) to represent the range of variability found in that study) and 173 western toads. Stephens' data indicate that *Bufo* in the Sierra Nevada occur in northern and southern evolutionary groups, each of which include both Yosemite and western toads (i.e., toads of both species are more closely related to each other within a group than they are to members of their own species in the other group). Further genetic analysis of Yosemite toads sampled from throughout their range, and from other toad species surrounding their range is needed to fully understand the evolutionary history and appropriate taxonomic status of the Yosemite toad." (USFWS 2002).

DESCRIPTION

Basic description: A toad.

General description:
A chunky, short-legged, warty amphibian with dominant parotoid glands at the back of the head and a conspicuous light-colored stripe running down the middle of the back. Coloration varies from brown, green to gray above and white with dark mottling below. Females are usually larger, more blotched, and have rougher skin than males (Hodge 1976, MacDonald 2003).

Length (cm): 13

Reproduction comments:
Breeding period variable depending on location (late April-July in Alaska). Mating takes place during daylight hours (Davis 2002). Females communally deposit an average of about 12,000 eggs/clutch, in two strands. Larvae metamorphose in first summer.

Ecology comments:
Ravens were significant predators on breeding toads in Oregon Cascades (Olson 1989). In Colorado, Corn (1993) observed a high rate of predation on breeding adults, evidently by ravens. Crow predation on adults was observed in Idaho (Brothers 1994).

Migration comments:
Migrates between aquatic breeding and terrestrial nonbreeding habitats. Outside the breeding season, movements and home range locations of adult toads range from 400 to at least 1600m from breeding ponds (Davis 2002).

Food Comments:
Metamorphosed individuals feed on various small terrestrial invertebrates. Larvae filter suspended plant material or feed on bottom detritus (Nussbaum et al. 1983).

Phenology comments:
Activity varies seasonally and geographically. Mainly diurnal in late winter and spring at low elevations. Mainly nocturnal in summer in lowlands. Active day or night in summer in mountains, depending on conditions. Inactive in winter in cold climates.

In Alaska, western toads are active during daylight hours, especially during damp weather (Hodge 1976, MacDonald 2003).

Habitat comments:
Global habitat comments:
Found in a wide variety of habitats: desert springs and streams, meadows and woodlands, mountain wetlands. In and around ponds, lakes, reservoirs, and slow-moving rivers and streams. Digs its own burrow in loose soil or uses those of small mammals, or shelters under logs or rocks. Eggs and larvae develop in shallow areas of ponds, lakes, or reservoirs or in pools of slow-moving streams.

State habitat comments:
Broad range of habitat use. Can be found from sea level to high mountain elevations; usually in open, non-forested areas near water. Primarily terrestrial, they enter water to breed in a variety of ponds, lakes, streams, backwaters, ephemeral and sometimes brackish pools (Hodge 1976, MacDonald 2003). Hibernates in burrows below frostline in forested cover adjacent to aquatic habitat (MacDonald 2003).

STATUS

Global rank: G4 (1996-10-17)
Global rank reasons:
Large range in much of the western U.S. and western Canada; locally common, but rapid losses and declines of many populations across the range for unknown reasons, even in relatively pristine environments, causes concern.

State rank: S2? (2004-06-23)
State rank reasons:
Found in coastal rainforests on the mainland and islands throughout Southeast Alaska, northward along Gulf Coast to Prince William Sound (PWS). Overall population unknown. Formerly abundant and widespread, but local knowledge suggests sharp population declines. Requires further study. Major concerns include habitat degradation and fragmentation from development and glacial rebound, temperature stressors related to warming winters, and potential bacterial and fungal infections.

DISTRIBUTION AND ABUNDANCE

Range:
Global range comments:
Pacific Coast from southern Alaska (Wiedmer and Hodge 1996) to Baja California, east through the Rocky Mountains in west-central Alberta, Montana, Wyoming, Utah, Colorado, and (formerly) northern New Mexico; absent from most of the desert Southwest (Stebbins 1985). See Ross et al. (1995) for information on historical and recent occurrences in Utah. Sea level to at least 3640 m.

State range comments:
This species has the widest distribution of all amphibians in Southeast Alaska. Found in coastal rainforests on the mainland and islands throughout Southeast Alaska, northward along Gulf Coast to Prince William Sound (PWS). In PWS, have been documented on Montague and Hawkins islands, on the mainland as far west as the Columbia Glacier and as far north as the Tasnuna River, a tributary of the Copper River (MacDonald 2003).

Abundance:
Global abundance comments:
Total adult population size is unknown but likely exceeds 100,000. Still common in much of the range.

State abundance comments:
Overall population unknown. Formerly considered abundant and widespread in Southeast Alaska; more recently, long-time residents of Haines to Ketchikan have noted sharp declines (Carstensen et al. 2003, MacDonald 2003).

Trends:
Global trend comments:
Not threatened or declining in British Columbia or Alberta (see Green 1997). There are no published reports of population trends in Canada (Davis 2002). Rocky Mountain populations in Colorado and Wyoming have undergone a drastic decline since the 1970s (Corn et al. 1989; Hammerson 1989, 1992, 1999; Carey 1993). Has declined greatly in the Yosemite area of the Sierra Nevada, California where surveys in 1915 and 1919 described them as “exceedingly abundant” (Drost and Fellers 1996). Apparently declining in Yellowstone National Park (Peterson et al. 1992), Montana (Reichel and Flath 1995), and locally elsewhere (Olson 1989).

State trend comments:
Formerly considered abundant and widespread in Southeast Alaska; more recently, long-time residents of Haines to Ketchikan have noted sharp declines (Carstensen et al. 2003, MacDonald 2003) which has precipitated further study.

PROTECTION

Global protection comments:
Listed as endangered by the state of Colorado and considered a candidate species which is warranted, but not precluded, for federal listing by the USFWS in the southern Rocky Mountains (Maxell 2000). This species occurs in many national parks, wildlife refuges, and wilderness areas, however, protection of land may not protect the species where declines may be caused by acidification, ozone depletion, disease, or other causes. In Mexico it is found within San Pedro Martir National Park.

State protection comments:
In Alaska, amphibians are managed by Alaska Department of Fish and Game under statute 16.05.030, in which amphibians are legally included in the definition of “fish”. This statute makes it illegal for anyone to “hold, transport or release” any native amphibians without a valid permit. Habitat protected in wilderness areas such as Stikine-Leconte and Baranof Wilderness areas of the Tongass National Forest. Habitat also protected where species occurs in Glacier Bay and Wrangell-St. Elias National Park and Preserves and Klondike Gold Rush and Sitka National Historic Parks (Anderson 2004).

THREATS

Global threats comments:
Extent of threat range-wide is not certainly known. Listed as S4 (apparently secure) in Idaho, Montana, Nevada, Alberta, and British Columbia, S5 (secure) in California.

Decline in the Southern Rocky Mountains is not due to acidification of breeding habitats (Corn and Vertucci 1992). Carey (1993) hypothesized that some environmental factor or synergistic effects of more than one factor may stress toads, causing suppression of the immune system or indirectly causing immuno-suppression by effecting elevated secretion of adrenal cortical hormones; immuno-suppression, coupled with the apparent effect of cold body temperatures on the ability of the immune system to fight disease, may lead to infection by *Aeromonas hydrophila* bacteria (causes "red-leg") or other infectious agents and subsequently to death of individuals and extirpation of populations.

Die-offs in the Southern Rockies have been associated with chytrid fungus infections.

Eggs are highly susceptible to the pathogenic fungus *Saprolegnia ferax*, which may be introduced during fish stocking (Kiesecker and Blaustein 1997, Kiesecker et al. 2001). Kiesecker et al. (2001) observed catastrophic embryo mortality from *S. ferax* infection in shallow water that was protected from UV-B but not in water protected from UV-B. Some have proposed that declines are related to sensitivity of eggs to increased levels of ultraviolet radiation (Blaustein et al. 1994), but studies by

Corn (1998) yielded no support for UV-B alone as the cause of declines. Also, spectral characteristics of natural waters likely shield eggs from detrimental physiological effects in all but the clearest waters (Palen et al. 2002). Corn and Muths (2002) proposed that temperature stress is as plausible a hypothesis as increased UV-B to explain episodes of high mortality observed in Oregon (Kiesecker et al. 2001).

In the Cascade Range of Oregon, persistent predation on adults by ravens during the toad breeding season appears to have contributed significantly to some population declines (Olson 1992). Possibly significant predation by birds also has been observed in Colorado and Idaho.

Decline may be related at least in part to habitat destruction and degredation, water retention projects, predation by and competition with native and non-native species, fishery management activities, or other factors, but these factors have not been adequately assessed.

Bufo boreas is susceptible to trematode infections that can cause severe limb malformations (Johnson et al. 2001).

State threat comments:
Possible threats included fungal and bacterial infections, such as the chytrid fungus *Batrachochytrium dendrobatidis*, which affects adults, and the pathogenic fungus *Saprolegnia ferax*, which attacks eggs and may be introduced during fish stocking (Kiesecker and Blaustein 1997, Kiesecker et al. 2001). Although no evidence for infected toads have been noted in Alaska, Carstensen et al. (2003) suggest the chytrid fungus as a possible cause for widespread declines in Southeast Alaska. Timing of the toad decline in Southeast has paralleled a major die-off observed in Colorado due to the chytrid fungus. Two reports of presumed dipteran parasitism on western toad in Southeast Alaska, one during 1980's, and more recently during summer 2003 (G. Streveler pers. comm. and A. Wertheimer pers. comm. in Carstensen et al. 2003).

Corn and Muths (2002) proposed that temperature stress is as plausible a hypothesis as increased UV-B to explain episodes of high mortality observed in Oregon (Kiesecker et al. 2001). Carstensen et al. (2003) reported that prolonged dry weather in Southeast Alaska, during in April and May 2003, led to pond dewatering that delayed or prevented toads from spawning in some ponds. Also, recently warming winters and associated shallower snow depth may be causing problems for toads which are not as tolerant to freezing conditions during dormancy as the wood frog *Rana sylvatica* (Carstensen et al. 2003).

Habitat destruction and degradation, due to development and postglacial rebound has significantly reduced historical habitat in the Mendenhall Valley, Juneau area.

In the Cascade Range of Oregon, persistent predation on adults by ravens during the toad breeding season appears to have contributed significantly to some population declines (Olson 1992). Potential for increased concentration of ravens and other avian predators due to human activity (i.e. landfills) could subsequently lead to increased predation.

RESEARCH AND INVENTORY NEEDS

Global research needs:
Research on causes of decline is critical.

State research needs:
Genetic studies needed as Alaska populations may comprise several endemic forms. PWS population, in particular may well be a distinct Ice Age relict. Research on causes of decline and limiting factors is critical. Research in undisturbed areas may help to better understand decline and threats to the population throughout its range.

Global inventory needs:
Many museum records are not specific enough for resurveying. Precise locations of breeding sites are needed for long-term monitoring.

State inventory needs:
Inventory to precisely determine the species' distribution is needed; population estimates for each area of occurrence are needed to determine status; if possible, establish programs to monitor population trends. Precise locations of breeding sites are needed for long-term monitoring. Inventory in undisturbed areas may help to better understand decline and threats to the population throughout its range.

CONSERVATION AND MANAGEMENT NEEDS

Global conservation and management needs:
Suggested management needs include limiting habitat fragmentation through the use of buffer zones around breeding habitats and limiting road construction to protect the connectivity of populations. Also, limiting the introduction of fish near or at breeding sites (Davis 2002).

State conservation and management needs:
Suggested management needs include limiting habitat fragmentation through the use of buffer zones around breeding habitats and limiting or managing road construction to protect the connectivity of populations in sensitive area. Prevent critical habitat loss of known breeding areas. The current population trend should be evaluated, and threats to populations identified. If specific threats are identified, priority should be placed on reducing these threats such that the population would remain secure into the future.

Reviewer(s): Stephen MacDonald, University of New Mexico; Blain Anderson, National Park Service, Anchorage, AK.
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NatureServe Conservation Status Factors Edition Date: 02Jan2004
NatureServe Conservation Status Factors Author: Reichel, J. D., and G. Hammerson
Element Ecology & Life History Edition Date: 20Mar2003
Element Ecology & Life History Author(s): Hammerson, G.

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