

Southeast Alaska, Chichagof Island Redlegged Frog Population Status

Progress Report
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Summary:

Redlegged frog (*Rana aurora*) visual detection surveys were conducted on Chichagof Island in 2006. Surveys conducted at Freshwater Bay in early May documented 100% *R. aurora* occupancy of suitable wetland breeding habitat below 200m elevation located in an area extending north of Freshwater Creek trending southeasterly through the Kennel Creek and Pavlof River watersheds and westerly around East Point into Tenakee Inlet (approximately 6000 hectares). DNA analysis of specimens collected within the study area confirmed *R. aurora* identification of all samples with a population origin from the clade in western Washington and Oregon. No native amphibians were detected during this field work.

Introduction:

An introduced population of *Rana aurora* has become established in the Freshwater Bay area of NE Chichagof Island. The existence of this population was first documented when a single specimen was captured in 2000 and another in 2001. These frogs were photographed, released and initially were suspected to be *Rana luteiventris* (Colombia spotted frog) which are native to Southeast Alaska but known only in proximity to large mainland river systems (Hodge 1976, MacDonald 2003). In 2002, specimens collected by USFS Hoonah Ranger District fisheries staff were identified by R. P. Hodge as *R. aurora* (Sargent, et.al. 2003). It was subsequently confirmed that a schoolteacher purchased frog eggs from a biological supply company for a classroom project and released about two dozen newly metamorphosed juveniles in a small pond near Kennel Creek circa 1982 (Hodge 2004). The natural range for *R. aurora* is northwestern California, Oregon, Washington, and southern British Columbia and populations have been declining in all regions. British Columbia has listed the red-legged frog as a species of special concern and USFS lists sensitive status in all states in its natural range (Waye 1999).

Executive Order 13112 (1999) defines “invasive species as an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” Impacts resulting from the presence of this exotic redlegged frog population have not been determined; however the red-legged frog’s ability to persist and spread across drainages may, at a minimum, represent a threat to local amphibian populations through interspecific competition or disease transmission. An *Assessment of Invasive Species in Alaska and its National Forests* (USFS 2005) assigned an Invasive Threat Ranking of ‘High’ for this frog.

In 2006 we initiated an investigation of the status of this frog population due to concerns about the animal’s potentially invasive impacts in Alaska habitats. Our primary objectives were to:

- 1) Document *R. aurora* distribution and range (spread of this population).
- 2) Document any amphibian interspecific interactions, or incidence of disease or parasitism that might be attributed to red-legged frog presence.
- 3) Conduct DNA analysis of collected specimens to irrefutably determine taxonomic status and geographic origin of the population.

Methods:

We utilized USGS Amphibian Research and Monitoring Initiative (ARMI, 2006) protocols and metrics (<http://armi.usgs.gov/PAOEstimator.asp>), which we were concurrently testing for western toads in Southeast Alaska in an interagency pilot study in 2005-06 (Pyare 2007). National Wetlands Inventory (NWI) GIS delineations were utilized to focus surveys in wetland habitats with the highest potential for amphibian occurrence, breeding, and detection. Amphibian presence/absence and environmental covariate data were collected for analysis using the “proportion area occupied” (PAO) metric and the model PRESENCE which will provide a baseline for future monitoring efforts of this population. Physical habitat and vegetative data were collected at all water bodies where amphibians were detected.

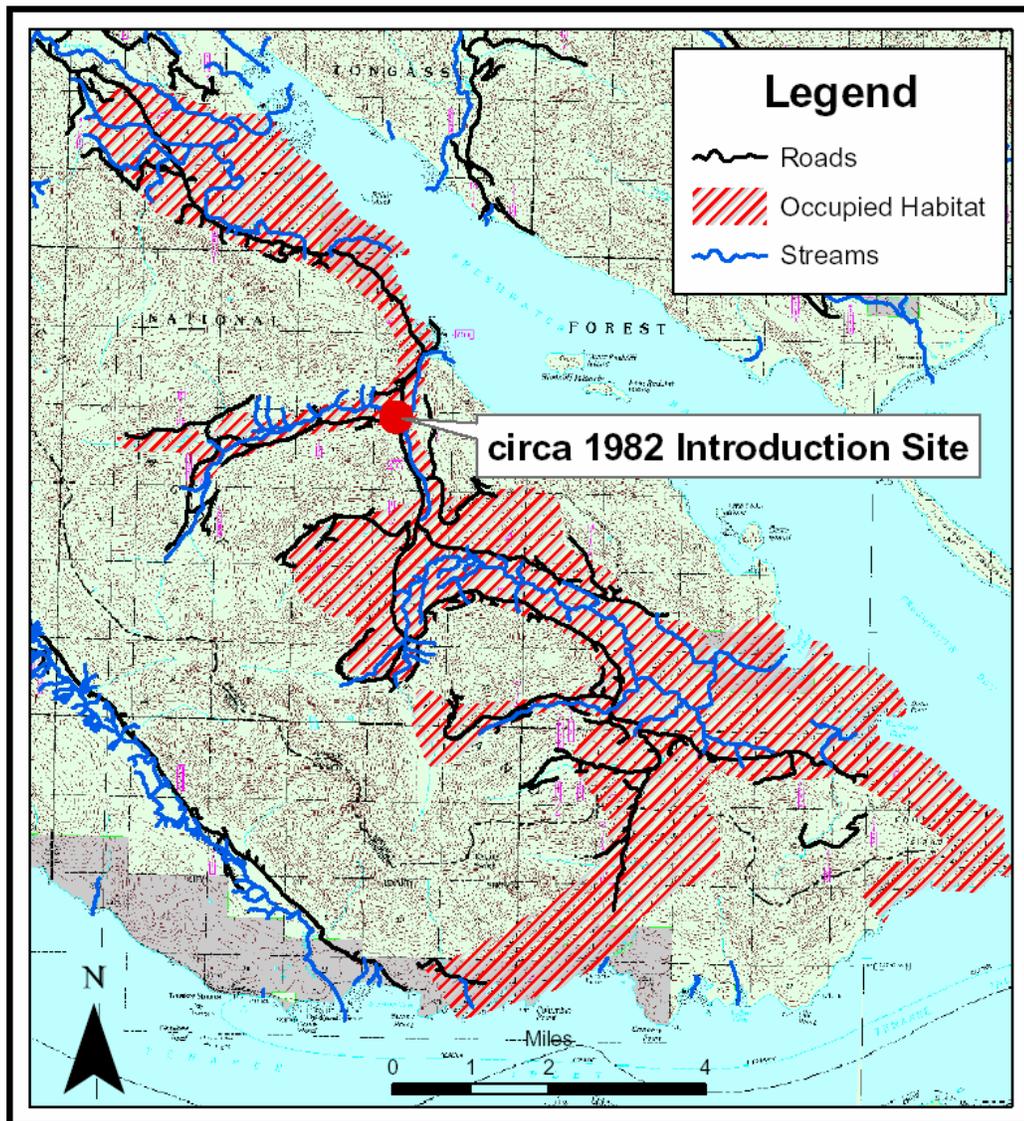
Diurnal visual encounter surveys (VES) were the primary survey technique utilized (Bury and Major 1997). However, night surveys have been found to be more effective than diurnal surveys in locating California red-legged frogs (*R. draytonii*) (Fellers and Kleeman 2006). This technique entails shining a bright light across ponds and locating frogs by their reflected eye-shine but the authors note that surveys should also include diurnal visits to locate egg masses or tadpoles which are less likely to be observed at night. We chose not to conduct night surveys for logistics and safety reasons as it was deemed to not be prudent to be navigating to remote survey areas in brown bear habitat in darkness and we felt we could adequately document frog presence by egg mass observations. Red-legged frogs have a low frequency breeding call most often made from underwater that does carry far. They only call for very brief periods (about a week) during the actual spawning event so calling surveys were not considered as a viable survey technique.

Gee type minnow traps, baited with minced clams, were set out overnight to successfully capture tadpoles, juvenile, and adult red-legged frogs from the introduction site and the extent of distribution. Representative collected specimens were sent to Greg Pauly at the University of Texas, Austin for DNA analysis.

Results and Discussion:

Field surveys began May 1, 2006, soon after reports from pilots indicated that the ice was off the majority of small wetland ponds. Road access from Hoonah was still blocked by snow so we accessed Freshwater Bay by boating from Juneau and hiking the road system to survey units. The main breeding event had all ready occurred (we estimated a week to ten days earlier by egg mass condition) and daylight surveys located few frogs, however, the timing was ideal for locating egg masses. By conducting surveys when egg masses were present our ability to detect the presence of *R. aurora* was magnitudes greater than if trying to locate individual animals which are very wary and cryptic.

We documented significant population growth and range expansion outward from the initial introduction site with 100% breeding habitat occupancy over 6000 contiguous hectares of wetland and forested habitats below 200 m elevation (Figure 1).



**Chichagof Island
Red-legged Frog
Known Distribution
2006**

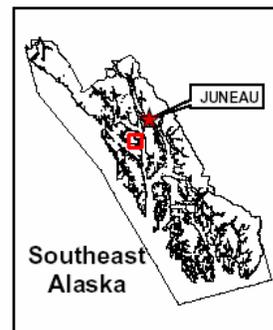


Figure 1

These animals were found along a thirty kilometer long corridor of contiguous wetland habitat. Red-legged frogs utilize terrestrial forest habitats and actual occupied habitat is likely greater than depicted since forested habitats were not surveyed due to financial and time constraints and the highly cryptic nature and low detectability of frogs occupying these habitats. We have received reports of sightings of “frogs” within the community of Tenakee Springs, which likely are either western toads (*Bufo boreas*) or *R. aurora*. The current known distribution of this introduced population of *R. aurora* extends from north of Freshwater Creek (N57.9499, W135.2786) trending southeasterly through the Kennel Creek and Pavlof River watersheds and westerly around East Point into Tenakee Inlet (N57.7822, W135.1263) and includes most side drainage wetlands surveyed to 200m elevation. One specimen was collected at elevation 235m indicating they may also occur at higher elevations especially when foraging in terrestrial forested habitat. Most breeding wetlands occur below 200m so we focused 2006 survey efforts in those lowland areas.

Western toads have been documented on Chichagof Island; however none were located by us in 2006 so we were not able to observe any interspecific interactions. A literature review reveals that Oregon spotted frogs (*Rana pretiosa*) have been documented to consume newly transformed juvenile toads (Pearl and Hayes 2001). Adult male *R. aurora* spend the spring and summer in and near breeding ponds and would likely be present at many toad breeding sites. If this *R. aurora* population were found to prey on newly metamorphosed toads or tadpoles they may have a significant impact upon the native toad viability on the island. Robert Hodge (pers. com. 2007) stated “I predict *R. aurora* will become the ‘bullfrog’ of AK! *R. aurora* is a large, aggressive, prolific Ranid with a big appetite for amphibians, fishes & invertebrates.”

After examining numerous juvenile red-legged frogs on Chichagof we suspected the previous identification and believed occurrence of wood frogs (*Rana sylvatica*) on Chichagof may have been in error. We re-examined the 2001 *R. sylvatica* voucher specimen from Chichagof Island housed in the Auke Bay Laboratory Collection with Bruce Wing and have identified this specimen as *R. aurora*. Voucher photographs collected in 2001 and 2003 also appear to be *R. aurora*. Our findings were discussed with R. Hodge and Stephen MacDonald (pers. com. 2007) and both agree that we should now state that *R. sylvatica* has never been documented to occur on Chichagof. 2006 DNA samples collected in the survey area have been processed by Greg Pauly (pers. com. 2006) and confirm that all animals collected in 2006 on Chichagof are *R. aurora*, with a parent source from northwestern Oregon or Washington. This collaborates with investigations by Hodge (2004) that revealed a former school teacher purchased one or two egg masses of *R. aurora* from Powell Laboratories (Carolina Biological Supply) ca. 1982 and staff there confirmed that Powell collected and sold egg masses from the Columbia River Gorge at that time.

Future Monitoring Plans:

Additional work is programmed for FY 2007 to attempt to identify impacts, further define population distribution limits, and forward management considerations. Since the animals have made it into Tenakee Inlet they may well have begun to extend their range north up the Indian River drainage. If we do find the population moving up this drainage it should afford us an excellent opportunity to monitor their yearly rate of expansion. Upper Freshwater Creek will also be surveyed to see if the frogs may have been able to move upriver through the gorge that may serve as a barrier to westward movement into the Game Creek drainage.

One potential impact of this introduced frog population may be the increased ability of amphibian pathogens to infect native amphibian populations. *Bactrachochytrium dendrobatidis* (chytrid) infections have been associated with the decline of many native amphibian populations worldwide (Carey 2000). We will conduct chytrid testing of this population in 2007. We are coordinating with Greg Pauly and Santiago Ron, at the University of Texas, to conduct ecological niche modeling (Ron 2005) for red-legged frogs to better assess Alaska habitats relative to native habitats and the potential for expansion of this population to other Alaska sites. This acquired knowledge will also assist in a risk assessment of this population's threat to our Alaska native amphibian populations.

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