**THE THERMAL REQUIREMENTS OF OREGON SLENDER SALAMANDERS**
**2000 Progress Report**

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Oregon Slender Salamanders (*Batrachoseps wrighti*) are tiny amphibians from the lungless family "Plethodontidae." With the northern-most distribution of all slender salamanders, the range of the Oregon Slender is relatively small and narrow, stretching from the Columbia River Gorge, south into the western slopes of the Cascade Mountains, including the Mt. Hood and Willamette National Forests, and as far east as Hood River.

Oregon Slender Salamanders (OSS) live almost exclusively in old growth and second growth Douglas fir forests with fern, moss and a large number of fallen trees. They seem to prefer these forests over young stands and can be quite abundant in the right habitat. OSS are seldom found in clear-cuts.

Adults, juveniles and hatchlings are commonly found under bark, inside decaying logs – where they usually lay their eggs – under surface debris or around the bases of snags and tree stumps. Occasionally found in clusters of six or more, OSS prefer Douglas fir wood that splits cleanly into moist, red layers or blocks with little or no powder. During mild rainy periods, they are often encountered foraging beneath woody debris, on a clean slab of wood, under a pile of leaves or entangled in a damp clump of moss.

As a result of numerous studies involving the thermoregulation of amphibians, biologists agree that most if not all amphibians exhibit a minimum and maximum thermal tolerance or "Critical Resistance Level" (CRL) to extreme environmental conditions. These CRLs have been proven to vary from species to species, depending on latitude, altitude and climate.

The Preferred Body Temperature (PBT) of most Plethodon salamanders is generally the same or very close to the temperature of the microhabitat in which they live. However, terrestrial salamanders from the temperate zones such as OSS are exceptional in that they seldom exhibit behavioral thermoregulation in the field. This means that thermoregulation must be achieved through physiological adjustments as the salamanders respond to variations in the environmental temperatures – this is known as "thermal acclimation." Water relations, including dehydration and rehydration rates, also limit the range of the salamanders' thermoregulatory behavior because hydric requirements restrict them to moist environments. Moreover, thermal tolerances of some montane species are quite narrow, and these in combination with moisture requirements presumably are the factors that restrict the distribution of such species to specific microhabitats within limited geographical areas.

Amphibians are "ectotherms" and generally have body temperatures that are the same or very close to that of their immediate surroundings. Large Douglas fir logs, especially those in an advanced stage of decomposition, positioned vertically on a slope, and protected by a good canopy cover of conifers, serve as cool "moisture chambers" – perfectly suited to the

salamanders' thermal requirements and are adequate for habitation all year round. Cool internal temperatures and high moisture content may explain why such tiny creatures inhabit such enormous logs. Rotting wood absorbs the rainwater like a sponge and retains a lot of moisture. A log with a shady canopy is more apt to attract salamanders than a log exposed to direct sunlight and subject to rapid moisture loss from evaporation.

In this study I set out to compare the environmental conditions (air temperatures and relative humidity) with the microhabitat conditions at selected sampling sites within the northern half of the species' known range.

Between March 21 and October 28, I conducted a field study of OSS inhabiting four ancient forests in Northwestern Oregon:
A.) Blue Hole Nature Preserve, Clackamas County
B.) Silver Falls State Park, Marion County
C.) Oxbow Regional Park, Multnomah County
D.) Three Lynx, Clackamas County

These four study sites, and later a fifth remote site, were selected through a series of random searches of conceivably ideal habitat. The study sites were selected solely because of their high number of salamanders, and only sites with a minimum of two salamanders were chosen. The first four sites at each of the four locations with two or more salamanders were immediately flagged as designated study sites and given a corresponding letter "A" through "D."

During the course of the study I visited the four locations 15 times and found a total of 25 salamanders. Two were captured at Blue Hole, 11 were captured at Silver Falls, 10 were captured at Oxbow, and 2 were captured at Three Lynx.

My methods for gathering data included inserting a digital probe thermohygrometer deep into the heartwood of the logs at each of the four study sites where salamanders were found, then comparing the internal readings to the climatic conditions outside the logs, taking into consideration seasonal conditions, elevation and time of day.

Rotting logs, particularly ones measuring thirty (30) feet or more, were tested for thermal and moisture gradients by inserting thermohygrometers into the top (T), middle (M) and bottom (B) sections of the logs and comparing the results.

As expected logs oriented vertically on a moderate to steep slope proved the most ideal, often displaying a wider range of gradients than those positioned horizontally. Following this procedure, internal log temperatures and moisture levels were monitored at regular intervals throughout the experiment in both 24 hour periods and in seasonal cycles whenever possible, then compared against the ambient conditions and in some instances to similar logs in and around the study sites.

Note: There are almost certainly stable breeding populations of OSS at both Silver Falls and Oxbow (sites B and C), where there seem to be high concentrations of salamanders. They may in fact support community nesting sites – for it is here that I have found the largest adults and tiniest hatchlings.

| SITE | LOCATION | COUNTY |
|---|---|---|
| A | Blue Hole | Clackamas |
| B | Silver Falls | Marion |
| C | Oxbow park | Multnomah |
| C2 | Bull Run | Clackamas |
| D | Three Lynx | Clackamas |

| | 24 HOUR PERIOD |
|---|---|
| 1 / 4 | midnight – 6:00 AM |
| 2 / 4 | 6:00 AM – noon |
| 3 / 4 | noon – 6:00 PM |
| 4 / 4 | 6:00 PM – midnight |

| | |
|---|---|
| T | top |
| M | middle |
| B | bottom |

REFERENCES

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