Amphibian assemblages in zero-order basins

Introduction

Zero-order basins are contributors to 1st-order systems, including all drainage areas above sustained sourc and deposition (Tsuchimoto et al. 1982. Figure 1). In Pacific northwestern forested landscapes, limited protection is offered to these basins (Young, 2000).

No study has characterized amphibian communities in zero-order basins, and management of biotic resources in these basins has not been explicitly established. To address these information needs, I investigated amphibian distribution in zero-order basins:

- along longitudinal and lateral gradients
- relative to three geomorphic surfaces

Methods

Study sites included 63 unmanaged zero-order basins in headwater areas of the Coquille River Basin, Oregon, in lands administered by the Bureau of Land Management (Figure 2). I quantified amphibian densities using hand capture, in transects stratified by geomorphic surface (Figure 3).

I made between-species comparisons of proximity to ridgeline (shortest distance from ridgeline to capture) and maximum distance from basin center using general linear models. For each species, I compared differences in captures between 3 geomorphic surface zones (valley, headmost, slope) and 3 lateral zones (0-2 m, 2-5 m, >5 m from center) using log linear models. I used indicator species analysis (Dufrène and Legendre 1997) to quantify the degree of association between amphibian species and geomorphic and lateral zones. I developed species assemblages associated with each zone in each typology, considering only species whose maximum indicator values were significant (p<0.05).

Results

Amphibians with over 30 captures included 2 sensitive species (southern torrent and clouded salamander), one riparian indicator (Dunn’s salamander), one aquatic species (Pacific giant salamander) and two generalist/upland species (western red-backed salamander and ensatina).

Five of 15 sensitive species comparisons for proximity to ridgeline were significant (Table 1). Wet species (Pacific giant, southern torrent, and Dunn’s salamanders) were captured 1.0 to 3.6 times further from ridgeline than “dry” species (clouded salamander and ensatina). Nine of 15 comparisons for maximum distance from basin center were significant (Table 2). Maximum distances from center of captures for wet species were less than half that of dry species.

<table>
<thead>
<tr>
<th>Wet species</th>
<th>Dry species</th>
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<tbody>
<tr>
<td>Pacific giant</td>
<td>Clouded</td>
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<tr>
<td>Pacific giant</td>
<td>W. red-backed</td>
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<tr>
<td>S. torrent</td>
<td>Clouded</td>
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<tr>
<td>S. torrent</td>
<td>W. red-backed</td>
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<tr>
<td>Dunn’s</td>
<td>Clouded</td>
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<tr>
<td>Dunn’s</td>
<td>W. red-backed</td>
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Conclusions

- Riparian and terrestrial amphibians partitioned spatial habitats in zero-order basins.
- Amphibian diversity was highest within 5 m of basin center, supporting the importance of inner gorges (Olson et al. 2000), and suggesting spatial compression of fluvial and hillside habitats.
- Zero-order basins supported distinct amphibian assemblages (Figure 5) including:
  - A valley assemblage (S. torrent and Dunn’s salamanders) associated with fluvial processes (e.g. saturation, runoff), 0-2 m from center.
  - A headmost assemblage (ensatina and clouded salamander) associated with intermediate overstory structure and fluvial processes.
  - A slope assemblage (western red-backed salamander), in stable areas 2-5 m from center.

Management should consider the role of zero-order basins (and geomorphic surfaces within them) in support of distinct amphibian assemblages in steep, forested landscapes.

Citations

