**The Evaluation of Citizen Science Smartphone Technology in Herpetofauna Monitoring**

Julie Wittmann* and Derek Girman  
Department of Biology, Sonoma State University  
protecthabitat@gmail.com  
http://www.protecthabitat.com

**INTRODUCTION**

With increasing interest in the impacts of climate change among members of the general public, non-scientists using recent advances in technology can potentially improve the way in which biological observations can readily be documented. New and advancing technologies, especially those involving the use of smartphones by volunteers are tools that could assist with climate change indicator species research and monitoring which are yet to be explored by research scientists and resource managers. The results of the volunteer and citizen science contributions in this research will provide feedback to resource managers to improve knowledge about how to effectively use participants and related technology for amphibian and reptile monitoring.

**METHOD**

**Step 1** Find organism underneath each coverboard during coverboard lift. Missed observations may occur from lack of visibility due to camouflage or size of organism.

**Step 2** Photograph each organism using citizen science smartphone application. Missed observations may occur due to organism visibly observed but organism escapes or hides during photograph opportunity. Technology problems may also occur during this time.

**Step 3** Upload observations from smartphone to website. Observations may not be documented electronically due to participants forgetting to upload observations. Also, observations may make it into participants’ account but not into project.

**Step 4** Observations may be available to become identified through online crowdsourcing. Not all observations may have the information to become identified, became identified to species, or identified correctly. Crowdsourcing species identification effort and accuracy may vary due to photograph quality or online crowd sourcing effort or ability.

**PRELIMINARY RESULTS**

**USE OF CITIZEN SCIENCE SMARTPHONE TECHNOLOGY BY VOLUNTEERS MONITORING AMPHIBIANS AND REPTILES, TRIAL 1, N=591**

<table>
<thead>
<tr>
<th>Observations Associated and Not Associated with Technology Problems, Trial 1</th>
<th>5%</th>
<th>14%</th>
<th>0%</th>
<th>8%</th>
<th>95%</th>
<th>86%</th>
<th>100%</th>
<th>92%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations Associated and Not Associated with Technology Problems, Trial 2</td>
<td>5%</td>
<td>14%</td>
<td>0%</td>
<td>8%</td>
<td>95%</td>
<td>86%</td>
<td>100%</td>
<td>92%</td>
</tr>
<tr>
<td>Observations Associated and Not Associated with Technology Problems, Trial 3</td>
<td>5%</td>
<td>14%</td>
<td>0%</td>
<td>8%</td>
<td>95%</td>
<td>86%</td>
<td>100%</td>
<td>92%</td>
</tr>
</tbody>
</table>

**FUTURE RESEARCH**

These initial results show that there are several areas for improvement using citizen science smartphone technology as a method to monitor herpetofauna by volunteers. Smartphone Technology Problems were associated with 21% of herpetofauna. Organisms not visibly seen by volunteers during the first step, the coverboard search includes a significant proportion of juvenile salamanders. Similarly, the most abundant and camouflaged species, the Slender Salamander which is also somewhat small in size proved difficult for volunteers to see. Observations not identified to the species level through crowdsourcing accounted for 38% of herpetofauna. There have been no misidentification of species through citizen science crowdsourced identification, all observations uploaded and identified to the species level were correct. Further trials will determine how quickly volunteers improve over time with these various steps involved in using citizen science smartphone technology so a more detailed evaluation can then be made.

**ACKNOWLEDGEMENTS**

Thank you to all of the undergraduate students and nature-preserve affiliates and staff who have made this research possible. Thanks to Julanne Bradbury for her amazing contribution and enthusiasm. Thanks to Michelle Hohbe, Adina Menzelender and Greg Quinn for their continuous mentorship and support. Thanks to Celeste Dodge and Whalen Dillon for their support by sharing abiotic data for the herpetofauna aspect of this research.