The unexpected discovery of a new cryptic frog from the urban northeastern US
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R. sp. nov.

ABSTRACT

Herein, we review our pending taxonomic description of a previously undescribed leopard frog (genus Rana [= Lithobates]). This species was first detected in the New York City metro area and is similar to two regional congeners; northern and southern leopard frogs (R. pipiens and R. sphenocophala, respectively), and remained undocumented until recently despite residing in this heavily inventoried region. Elucidation of a novel, range-limited frog from one of the largest, most well-studied urban corridors on earth underscores the potential for new species in unexpected locales (including those not typically associated with concealed biodiversity or endemism) and highlights several potential conservation implications.

INTRODUCTION

The R. pipiens complex includes several rare or declining species and has long been a source of taxonomic uncertainty and debate (Brown et al. 1977), particularly in the northeast and New York/New Jersey metro area. In 2012, Newman et al. reported molecular evidence of a cryptic fourth “spotted” ranid among three previously recognized spotted congeners that included R. pipiens, R. palustris, and R. sphenocophala (the species to which the new frog was previously included).

To complete our taxonomic description, we are supplementing existing molecular data from Newman et al. (2012) with bioacoustic, morphological, and behavioral evidence to formally identify, diagnose, and separate the new species from these congeners. This information will also aid federal and state biologists in determining the conservation status of the new species.

Bioacoustics:

• Record and compare call-attribute differences between R. sp. nov. and similar regional congeners (including the bioacoustically similar R. sylvatica)

Molecular Genetics:

• Confirm holotype nuDNA + mtDNA matches with Newman et al. (2012)

Morphology:

• Measure museum specimens to compare standard characters
• Screen specimens and photos for other diagnostics to separate species

Behavior:

• Observe breeding events and determine phenological species differences

RESULTS

Table 1. Summary data of detected morphological differences between R. sp. nov. and three regional congeners.

<table>
<thead>
<tr>
<th>Character</th>
<th>NOV</th>
<th>PALU</th>
<th>PIP</th>
<th>SPHE</th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td>150</td>
<td>33</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Average of HeadWidth</td>
<td>18.74</td>
<td>17.66</td>
<td>19.71</td>
<td>18.50</td>
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<tr>
<td>Average of HeadLength</td>
<td>18.52</td>
<td>17.57</td>
<td>18.87</td>
<td>20.27</td>
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<tr>
<td>Average of TymDiameter</td>
<td>4.82</td>
<td>3.97</td>
<td>4.42</td>
<td>4.81</td>
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<tr>
<td>Average of Eye_Nostril_Length</td>
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<td>4.00</td>
<td>4.48</td>
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<td>Average of Interorbital_Diameter</td>
<td>4.16</td>
<td>3.66</td>
<td>3.63</td>
<td>3.72</td>
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</tbody>
</table>

CONCLUSIONS

• The new species is restricted to large, mesic, open-canopied upland/wetland "complexes" (≥ 4 ha) in coastal and riparian-floodplain habitats, largely within the narrow northeast/mid-Atlantic I-95 corridor.

• Short spring breeding season w/dense, highly-social breeding aggregations.

• Current NY/NJ metro range characterized by disjunct, isolated pops. including urban locales ≤ 5-10 km from Manhattan and the Statue of Liberty

CONSERVATION CONSIDERATIONS

• Given range restrictions, urban geography, succeeding habitats, and disjunct, highly-social populations, this may be one of the most at-risk frog species along North American east coast.

• Major enigmatic extirpations (NY and CT) have been documented (Newman et al. 2012) and the coastal range may be threatened by rising sea levels and more frequent and powerful storms.

• At least seven states impacted by this discovery (including some w/existing leopard frog protections). Clear identification of cryptic species is essential for proper conservation and management.

• Demonstrates potential risk with presumed same-species relocations across regional landscapes. Relocations should mandate "proof of species."

LITERATURE CITED


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Figure 1. Phylogenies from Newman et al. (2012) comparing four R. sp. nov. populations in NY and NJ to three other regional congeners.

Figure 2. Range map and bioacoustic waveforms of primary calls of four regional congeners.

Figure 3. Examples of subtle physical diagnostic differences.

Figure 4. Phenological differences between R. sp. nov. and R. sphenocophala.