HERPETODIVERSITY OF XUAN SON NATIONAL PARK (PHU THO PROVINCE): NEW FINDINGS

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Xuan Son National Park in the Phu Tho Province in northern Vietnam is notable for its high plant and animal diversity. Apparently, the richness of the Park flora and fauna is accounted for its fortunate location at the south-eastern extremity of the Hoang Lien mountain ridge, where the slate rocks meet the limestone karst massifs. This contact creates not only the very diverse picturesque landscapes of the Park but also a variety of habitats that refuge a rich herpetofauna. The additional interest to the fauna of Xuan Son NP is also caused by its closeness to the junction of the two major watercourses of northern Vietnam, Red River and Black River, which are considered as important zoogeographic boundaries in Indochina (Orlov, Ananjeva, 2007; Bain, Hurley, 2011). A number of rare and endangered amphibians and reptiles inhabit Xuan Son NP, including several recently discovered species, for example, the newt *Tylototriton vietnamensis* Böhme, Schöttler, Nguyen & Köhler, 2005 (Nguyen et al., 2009), the frogs *Odorrana orba* (Stuart & Bain, 2005) and *Leptolalax firthi* Rowley, Hoang, Dau, Le & Cao, 2012, the skink *Sphenomorphus cryptotis* Darevsky, Orlov & Ho, 2004 and the pit viper *Trimeresurus honsonensis* (Grismer, Ngo & Grismer, 2008), all recorded by Nguyen et al. (2013). Our field survey in 2014 allowed us to extend the list of amphibians and reptiles which are encountered in the Park. Some new interesting findings may further evidence the remarkable biodiversity of Xuan Son NP.

I. STUDY SITE AND METHODS

The field survey was taken out from 27 June to 7 July 2014 in several forested and rural areas of the Park: in the vicinity of the village Du (Tan Son District, Xuan Son Commune, approximate coordinates 21°07’28” N, 104°57’28” E, elevation 440 m a.s.l.), in the primary forest on the slate hills between the villages Du and Lap (21°08’12” N, 104°57’04” E, elevation 430 m a.s.l.), in the primary forest on the limestone karst hills in the vicinity of the villages Du (21°06’42” N, 104°57’25” E, elevations 420–900 m a.s.l.) and Lap (21°08’24” N, 104°56’26” E, elevation 240 m a.s.l.).

During the survey the temperature varied from 25.5°C (at night) to 30–31°C (at day), the rains were regular in afternoons and nights.

The inventory of amphibian and reptile fauna as well as anuran larvae was conducted during the day and night surveys. Additionally, series of 10 pit-fall traps were installed in the dipterocarp forest on slate hills and in the limestone massif near the village Du. All collected specimens were photographed in life and then preserved in ethanol (for adult specimens) or formalin (for larvae) after the sampling for genetic analysis.

II. RESULTS

During our survey we registered 47 species, including 21 amphibians and 26 reptiles (Table 1), some of which were not previously recorded in the Park.
Table 1

The list of amphibians and reptiles recorded in Xuan Son National Park during the field survey in June - July 2014

<table>
<thead>
<tr>
<th>№</th>
<th>Species</th>
<th>Habitat</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>DFS</td>
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<td></td>
<td></td>
<td>FLK</td>
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<td></td>
<td>RS</td>
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<td></td>
<td></td>
<td>RAA</td>
</tr>
<tr>
<td>class AMPHIBIA</td>
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</tr>
<tr>
<td>order Anura</td>
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</tr>
<tr>
<td>fam. Bufonidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Duttaphrynus melanostictus (Schneider, 1799)</td>
<td>+</td>
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<tr>
<td>fam. Megophryidae</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Leptolalax cf. bourreti Dubois, 1983</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Ophryophryne pachyproctus Kou, 1985</td>
<td>+</td>
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<tr>
<td>4</td>
<td>Xenophrys major (Boulenger, 1908)</td>
<td>+</td>
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<tr>
<td>fam. Dicroglossida</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>Fejervarya limnocharis (Gravenhorst, 1829)</td>
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<tr>
<td>6</td>
<td>Hoplobatrachus rugulosus (Wiegmann, 1834)</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Limnonectes bannaensis Ye, Fei, Xie &amp; Jiang, 2007</td>
<td>+</td>
</tr>
<tr>
<td>fam. Ranidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Amolops ricketti (Boulenger, 1899)</td>
<td>+</td>
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<td>9</td>
<td>Hylarana guentheri (Boulenger, 1882)</td>
<td>+</td>
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<tr>
<td>10</td>
<td>Odorrana cf. orba (Stuart &amp; Bain, 2005)</td>
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</tr>
<tr>
<td>11</td>
<td>Rana johnsi Smith, 1921</td>
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<tr>
<td>fam. Rhacophoridae</td>
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<td></td>
</tr>
<tr>
<td>12</td>
<td>Chiromantis vittatus (Boulenger, 1887)</td>
<td>+</td>
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<tr>
<td>13</td>
<td>Kurixalus odontotarsus (Ye &amp; Fei, 1993)</td>
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<tr>
<td>14</td>
<td>Polypedates megacephalus Hallowell, 1861</td>
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<td>15</td>
<td>Rhacophorus dennysi Blanford, 1881</td>
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<td>Rhacophorus kio Ohler &amp; Delorme, 2006</td>
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<td>17</td>
<td>Rhacophorus orlovi Ziegler &amp; Köhler, 2001</td>
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<td>18</td>
<td>Theloderma asperum (Boulenger, 1886)</td>
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<tr>
<td>fam. Microhylidae</td>
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<tr>
<td>19</td>
<td>Microhyla butleri Boulenger, 1900</td>
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<td>20</td>
<td>Microhyla fissipes (Boulenger, 1884)</td>
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<td>21</td>
<td>Microhyla heymonsi Vogt, 1911</td>
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<td>order Squamata – Sauria</td>
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<tr>
<td>fam. Agamidae</td>
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<tr>
<td>22</td>
<td>Acanthosaura lepidogaster (Cuvier, 1829)</td>
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</tr>
<tr>
<td>23</td>
<td>Draco maculatus (Gray, 1845)</td>
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</tr>
<tr>
<td>24</td>
<td>Pseudocalotes microlepis (Boulenger, 1887)</td>
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<tr>
<td>fam. Lacertidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Takydromus sexlineatus Daudin, 1802</td>
<td>+</td>
</tr>
<tr>
<td>fam. Scincidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Eutropis longicaudata (Hallowell, 1856)</td>
<td>+</td>
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</tbody>
</table>
Taking into account the data of the previous herpetological investigations (Nguyen et al., 2013), the fauna of the Xuan Son NP numbers at least 63 species of amphibians and reptiles (31 and 32, respectively).

**Habitat designations:**

- **DFS** (dipterocarp forest on slate hills) – lowland primary polydominant forest with the abundance of *Dipterocarpus* sp., with closed canopy and thick underbrush, on the slate hills at elevations up to 450 m a.s.l.
- **FLK** (forest on limestone karst) – lowland and submontane primary polydominant forest with the predominance of Elaeocarpaceae, Lauraceae, Moraceae, Sabiaceae, Anacardiaceae, etc., on limestone karst massifs, with thick underbrush and abundance of limestone rocks, at elevations from 240 to 900 m a.s.l.
- **RS** (rivers and streams) – Riverbeds, banks and overhanging vegetation of the rivers and forest streams in slate hills and limestone rocks at elevations from 240 to 420 m a.s.l.
- **RAA** (rural and agricultural areas) – villages, roads, fields and gardens, clearings and small artificial ponds in the environs of the villages Du and Lap, elevations from 240 to 420 m a.s.l.
By preliminary estimation, the herpetofauna of Xuan Son NP is composed of the representatives of two main ecological complexes. The first one embraces the widely distributed species which are characterized by high ecological plasticity and are rather common throughout the country, including highly disturbed natural habitats, as well as agricultural and rural areas (Orlov, Ananjeva, 2007; Poyarkov, Vassilieva, 2012). Among them are, for example, the toad Duttaphrynus melanostictus, the frogs Fejervarya limnocharis, Hoplobatrachus rugulosus, Microhyla butleri, M. fissipes, M. heymonsi and Polypedates megacephalus, the lizards Eutropis longicaudata and Takydromus sexlineatus, the snakes Sinonatrix percarinata, Xenochrophis flavipunctatus and Oligodon chinensis.

The forest and aquatic faunistic complexes are more diverse than the ubiquistic one (40 vs 15 species, respectively) and are composed of the rather stenoecic species that are more selective and exigent to their habitat and are quite sensitive to the disturbance of natural ecosystems. In Xuan Son NP among them are, for example, the megophryid frogs (Leptolalax, Ophryopryne, etc.) whose life is strictly associated with clear forest streams, as well as some arboreal frogs (Kurixalus, Rhacophorus) and the hollow-breeding Theloderma (Rhacophoridae). Some of our findings on amphibians are new not only for the Xuan Son NP, but also for the province Phu Tho, that allows to widen the distribution areas of certain species, for example, Leptolalax bourreti, Kurixalus odontotarsus, Rhacophorus kio, R. orlovi.

Among forest reptiles quite interesting findings were, for example, the relatively rare agamid lizard Pseudocalotes microlepis, previously known in Vietnam only from the provinces Bac Kan, Quang Ninh, Da Nang and Lam Dong (Nguyen et al., 2009), and the brightly colored skink Plestiodon tamdaoensis, which was also not previously recorded from Phu Tho Province. Another surprising finding was the rare colubrid snake Oligodon lacroixi encountered in southern China but known in Vietnam only from its type locality in Sa Pa (Lao Cai Province) (Nguyen et al., 2009; Orlov et al., 2010). Its congeneric Oligodon chinensis was also recorded for Phu Tho Province for the first time, although this species was rather numerous in rural habitats. A brightly colored and quite dangerous elapid Sinomicrurus macclellandi was added to the Park faunistic list.

The fauna of the forests on limestone rocks in the Park is especially rich in frog, lizard and snake species, possibly because of the abundance of suitable shelters, high humidity and quite difficult accessibility for humans and cattle. The very rich hydrographic net of the park, which includes rivers, large and small forest streams, waterfalls and seasonal watercourses also favors the variety of ecological niches. Taking into account the great habitat diversity in the Park, we presume that the herpetodiversity of the Xuan Son NR is still greatly underestimated.

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**TÓM TẮT**