

## Final Evaluation Report

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Your Details	
<b>Full Name</b>	Bui Dinh Duc
<b>Project Title</b>	Diversity and conservation of dragonflies and damselflies (Odonata) in Huu Lien Nature Reserve (northern Vietnam)
<b>Application ID</b>	38161-1
<b>Date of this Report</b>	3/1/2024

**1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.**

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Describe the diversity of adults of dragonflies and damselflies in Huu Lien NR				
Establish a database on the distribution and population status of the four endangered Odonata species that were recorded in previous studies, including: <i>Atrocalopteryx atrocyana</i> , <i>Atrocalopteryx coomani</i> , <i>Nihonogomphus schorri</i> and <i>Matticnemis doi</i>				We recorded the population of <i>Atrocalopteryx atrocyana</i> , but did not record populations of the three dragonfly species, <i>Atrocalopteryx coomani</i> , <i>Nihonogomphus schorri</i> and <i>Matticnemis doi</i> during our investigation
Decipher links between the environmental factors and Odonata species, subsequently giving proposed measures to reduce potential threats to Odonata species				
Enhance capacity building and raise awareness among local stakeholders in conserving the Odonata.			x	

**2. Describe the three most important outcomes of your project.**

**a).** In collaboration with our Vietnamese colleagues, particularly Dr. Phan Quoc Toan, a taxonomic expert specialising in Vietnamese Odonata, we have published a list of 143 Odonata species in five spatially separated karst ecosystems of Xuan Son National Park (Phu Tho Province), Huu Lien Nature Reserve (Lang Son Province), Hang Kia-Pa Co (Hoa Binh Province), Kim Hy Nature Reserve (Bac Kan Province), and Ba Be National Park (Bac Kan Province). This list comprises 61 species from eight families of damselflies and 82 species from seven families of dragonflies. The Huu Lien Nature Reserve contains 86 species.

**Table 1.** A list of Odonata species in karst ecosystems of Xuan Son National Park (XS), Huu Lien Nature Reserve (HL), Hang Kia-Pa Co( HKPC), Kim Hy Nature Reserve (KH), and Ba Be National Park (BB) Source: Phan *et al.* 2023

TT	Species	Locations				
		XS	HL	HKPC	KH	BB
	<b>Damselflies - Zygoptera</b>					
	<b>Family: Chlorocyphidae</b>		X			
1	<i>Aristocypha fenestrella</i> (Rambur, 1842)	X	X	X	X	X
2	<i>Heliocypha biforata</i> (Selys, 1859)	X	X			
3	<i>Heliocypha perforata</i> (Percheron, 1835)	X	X	X	X	X
4	<i>Libellago lineata</i> (Burmeister, 1839)	X	X			X
5	<i>Rhinocypha arguta</i> (Zhou & Zhou, 2006)	X	X			
	<b>Family: Philogangidae</b>					
6	<i>Philoganga robusta</i> Navás, 1936	X			X	
	<b>Family: Calopterygidae</b>					
7	<i>Atrocalopteryx atrocyana</i> (Fraser, 1935)		X			
8	<i>Atrocalopteryx coomani</i> Fraser, 1935	X				
9	<i>Atrocalopteryx auco</i> Hämäläinen, 2014*		X			
10	<i>Matrona basilaris</i> Selys, 1853	X				
11	<i>Matrona taoi</i> Phan & Hämäläinen, 2011*	X			X	
12	<i>Mnais mneme</i> Ris, 1916	X	X			
13	<i>Neurobasis chinensis</i> (Linnaeus, 1758)	X	X	X	X	X
14	<i>Vestalaria miao</i> (Wilson & Reels, 2001)	X	X			
15	<i>Vestalis gracilis</i> (Rambur, 1842)	X	X	X	X	X
	<b>Family: Euphaeidae</b>					
16	<i>Anisopleura qingyuanensis</i> Zhou, 1982	X				
17	<i>Cryptophaea vietnamensis</i> (van Tol & Rozendaal, 1995)	X			X	
18	<i>Euphaea decorata</i> (Hagen in Selys, 1853)	X			X	X
19	<i>Euphaea guerini</i> Rambur, 1842	X				
20	<i>Euphaea masoni</i> Selys, 1879	X	X		X	X
21	<i>Euphaea ochracea</i> Selys, 1879	X				
22	<i>Dysphaea basitincta</i> Martin, 1904		X		X	X
	<b>Family: Lestidae</b>					
23	<i>Lestes nodalis</i> (Selys, 1891)		X			
24	<i>Orolestes selysi</i> McLachlan, 1895		X			
	<b>Family: Coenagrionidae</b>					
25	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	X	X	X	X	
26	<i>Agriocnemis femina</i> (Brauer, 1868)	X				
27	<i>Aciagrion migratum</i> (Selys, 1876)		X			
28	<i>Aciagrion pallidum</i> Selys, 1891					
29	<i>Aciagrion occidentale</i> Laidlaw, 1919					
30	<i>Argiocnemis rubescens</i> Selys, 1877	X	X			
31	<i>Ceriagrion azureum</i> (Selys, 1891)	X				
32	<i>Ceriagrion auranticum</i> Fraser, 1922	X	X	X	X	
33	<i>Ceriagrion fallax</i> Ris, 1914	X	X	X	X	
34	<i>Ceriagrion nipponicum</i> Asahina, 1967		X			
35	<i>Ischnura senegalensis</i> (Rambur, 1842)	X	X			
36	<i>Paracercion ambiguum</i> Kompier & Yu, 2016*		X			
37	<i>Paracercion melanotum</i> (Selys, 1876)		X			

38	<i>Pseudagrion microcephalum</i> (Rambur, 1842)		x			
39	<i>Pseudagrion pruinosum</i> (Burmeister, 1839)	x	x	x	x	x
40	<i>Pseudagrion rubriceps</i> Selys, 1876		x	x		x
	<b>Family: Megapodagrionidae</b>					
41	<i>Agriomorpha fusca</i> May, 1933	x	x	x	x	x
42	<i>Rhinagrion hainanensis</i> Wilson & Reels, 2003	x	x	x	x	
	<b>Family: Platycnemididae</b>					
43	<i>Coeliccia chromothorax</i> (Selys, 1891)	x		x		
44	<i>Coeliccia cyanomelas</i> Ris, 1912	x		x		
45	<i>Coeliccia galbina</i> Wilson & Reels, 2003		x			
46	<i>Coeliccia poungyi</i> Fraser, 1924	x		x		
47	<i>Coeliccia pulchella</i> Kompier, Dow & Steinhoff, 2020*		x			
48	<i>Coeliccia pyriformis</i> Laidlaw, 1932	x			x	
49	<i>Coeliccia sasamotoi</i> Do, 2011	x				
50	<i>Coeliccia scutellum</i> Laidlaw, 1932	x	x	x	x	x
51	<i>Coeliccia uenoi</i> Asahina, 1997*	x				
52	<i>Matticnemis doi</i> (Hämäläinen, 2012)*		x			
53	<i>Copera marginipes</i> (Rambur, 1842)	x	x	x	x	x
54	<i>Copera vittata</i> (Selys, 1863)		x	x	x	
55	<i>Pseudocopera ciliata</i> (Selys, 1863)	x	x	x	x	x
56	<i>Indocnemis orang</i> (Forster in Laidlaw, 1907)	x	x	x	x	
57	<i>Prodasineura autumnalis</i> (Fraser, 1922)	x	x	x	x	x
58	<i>Prodasineura croconota</i> Ris, 1916	x	x	x	x	
	<b>Family: Platystictidae</b>					
59	<i>Protosticta grandis</i> (Asahina, 1984)	x			x	
60	<i>Protosticta satoi</i> Asahina, 1997*				x	
61	<i>Sinosticta debra</i> Wilson & Xu, 2007	x				
	<b>Dragonflies- Anisoptera</b>					
	<b>Family: Chlorogomphidae</b>					
62	<i>Chlorogomphus auratus</i> Martin, 1910	x				
63	<i>Chlorogomphus canhvang</i> Kompier & Karube, 2018*				x	
64	<i>Chlorogomphus nakamurai</i> Karube, 1995*			x		
65	<i>Chlorogomphus sachiyoae</i> Karube, 1995		x			
	<b>Family: Gomphidae</b>					
66	<i>Asiagomphus acco</i> Asahina, 1996	x				x
67	<i>Asiagomphus auricolor</i> (Fraser, 1920)		x			
68	<i>Asiagomphus monticola</i> Kompier, 2018*	x				
69	<i>Asiagomphus superciliaris</i> Kompier, 2018*		x		x	
70	<i>Burmagomphus vermicularis</i> Martin, 1904		x	x	x	
71	<i>Gomphidia abbotti</i> Williamson, 1907	x	x	x	x	
72	<i>Gomphidia kruegeri</i> Martin, 1904		x			x
73	<i>Gomphidictinus kompieri</i> Karube, 2016*	x				
74	<i>Fukienogomphus prometheus</i> (Lieftinck, 1939)		x			
75	<i>Heliogomphus scorpio</i> (Ris, 1912)					
76	<i>Ictinogomphus decoratus</i> (Selys, 1854)					

77	<i>Ictinogomphus pertinax</i> (Selys, 1854)		x			
78	<i>Labrogomphus torvus</i> Needham, 1931		x		x	
79	<i>Leptogomphus perforatus</i> Ris, 1912					
80	<i>Lamelligomphus camelus</i> (Martin, 1904)	x				
81	<i>Lamelligomphus formosanus</i> Matsumura, 1926	x				
82	<i>Macrogomphus albardae</i> Selys, 1878*		x		x	
83	<i>Megalogomphus sommeri</i> (Selys, 1854)		x			
84	<i>Merogomphus pavici</i> Martin, 1904	x			x	
85	<i>Nihonnogomphus schorri</i> Do & Karube, 2011*	x	x		x	
86	<i>Paragomphus capricornis</i> (Foerster, 1914)		x			x
87	<i>Phaenandrogomphus tonkinicus</i> (Fraser, 1926)				x	x
88	<i>Sieboldius gigas</i> (Martin, 1904)*		x			
89	<i>Sinictinogomphus clavatus</i> (Fabricius, 1775)				x	
90	<i>Trigomphus kompiei</i> Karube, 2015*		x			
	<b>Family: Aeshnidae</b>					
91	<i>Anax guttatus</i> (Burmeister, 1839)				x	
92	<i>Boyeria karubei</i> Yokoi, 2002	x				
93	<i>Gynacantha basiguttata</i> Selys, 1882		x			
94	<i>Gynacantha japonica</i> Bartenef, 1909		x			
95	<i>Gynacantha saltatrix</i> Martin, 1909		x			
96	<i>Gynacantha subinterrupta</i> Rambur, 1842	x				
97	<i>Periaeschna magdalena</i> Martin, 1909	x				x
98	<i>Planaeschna celia</i> Wilson & Reels, 2001*	x				
99	<i>Planaeschna cucphuongensis</i> Karube, 1999*	x				
100	<i>Planaeschna guentherpetersi</i> Sasamoto, Do & Vu, 2013*		x			
101	<i>Planaeschna ishigakiana</i> Asahina, 1951	x				
102	<i>Planaeschna tsuchi</i> Kompier, Karube, Futahashi & Phan, 2021*	x				
103	<i>Tetracantagyna waterhousei</i> (McLachlan, 1898)		x			
	<b>Family: Gomphomacromiidae</b>					
104	<i>Macromidia kellogi</i> Asahina, 1978		x			
	<b>Family: Macromiidae</b>					
105	<i>Epophthalmia elegans</i> (Brauer, 1865)	x				
106	<i>Macromia clio</i> Ris, 1916	x				x
107	<i>Macromia malleifera</i> Lieftinck, 1955	x				
108	<i>Macromia unca</i> (Wilson, 2004)	x				
	<b>Synthemistidae</b>					
109	<i>Idionyx thailandica</i> Hämäläinen, 1985		x		x	
110	<i>Idionyx carinata</i> Fraser, 1926		x			
	<b>Family: Libellulidae</b>					
111	<i>Acisoma panorpoides</i> Rambur, 1842	x	x		x	
112	<i>Atratothemis reelsi</i> Wilson, 2005				x	
113	<i>Brachydiplax chalybea</i> Brauer, 1868	x		x	x	
114	<i>Brachydiplax farinosa</i> Kruger, 1902					x
115	<i>Brachythemis contaminata</i> (Fabricius, 1793)	x	x	x	x	

116	<i>Cratilla lineata</i> (Brauer, 1878)	x	x		x	
117	<i>Crocothemis servilia</i> (Drury, 1773)	x			x	x
118	<i>Diplacodes trivialis</i> (Rambur, 1842)		x	x	x	
119	<i>Lyriothemis bivittata</i> (Rambur, 1842)					x
120	<i>Lyriothemis kameliyae</i> Kompier, 2017		x			
121	<i>Hylaeothemis clementia</i> Ris, 1909				x	
122	<i>Neurothemis fluvia</i> (Drury, 1773)		x	x	x	x
123	<i>Onychothemis tonkinensis</i> Martin, 1904		x			x
124	<i>Orthetrum chrysis</i> (Selys, 1891)	x	x	x	x	
125	<i>Orthetrum glacum</i> (Brauer, 1865)	x	x	x	x	
126	<i>Orthetrum melania</i> (Selys, 1883)	x			x	
127	<i>Orthetrum pruinosum</i> (Burmeister, 1839)	x	x		x	x
128	<i>Orthetrum sabina</i> (Drury, 1770)	x	x	x	x	x
129	<i>Orthetrum triangulare</i> (Selys, 1878)	x	x	x	x	
130	<i>Palpopleura sexmaculata</i> (Fabricius, 1787)		x		x	
131	<i>Pantana flavescens</i> (Fabricius, 1798)	x	x	x	x	x
132	<i>Potamarcha congener</i> (Rambur, 1842)		x		x	
133	<i>Pseudothemis zonata</i> (Burmeister, 1839)		x	x	x	x
134	<i>Rhyothemis variegata</i> (Linnaeus, 1763)				x	
135	<i>Rhyothemis plutonia</i> Selys, 1883		x			
136	<i>Tetrathemis platyptera</i> Selys, 1878	x				
137	<i>Tholymis tillarga</i> (Fabricius, 1798)		x	x	x	
138	<i>Tamea transmarina euryale</i> (Brauer, 1867)				x	
139	<i>Trithemis aurora</i> (Burmeister, 1839)	x	x	x	x	x
140	<i>Trithemis festiva</i> (Rambur, 1842)	x	x	x	x	x
141	<i>Trithemis pallidinervis</i> (Kirby, 1889)		x			
142	<i>Zygonyx iris</i> Selys, 1869	x	x	x	x	x
143	<i>Zyxomma petiolatum</i> Rambur, 1842	x	x	x		x

b). Among the four globally threatened species specially investigated, *Atrocalopteryx atrocyana*, *Atrocalopteryx coomani*, *Nihonogomphus schorri* and *Matticnemis doi*, we recorded the distribution and population status of *Atrocalopteryx atrocyana*.

**Table 2.** Distribution and population status of *Atrocalopteryx atrocyana* in sampling sites in Huu Lien Nature Reserve

Site	GPS (D°M'S")		Habitats	Individuals
KD1	21°39'30.72"N	106°22'8.98"E	Intact forest, near a lake	0
KD2	21°39'31.18"N	106°22'15.01"E	Intact forest, near a lake	1
KD3	21°39'30.60"N	106°22'18.84"E	Intact forest, near a lake	2
KD4	21°39'32.91"N	106°22'23.76"E	Intact forest, near a lake	0
KD5	21°39'36.70"N	106°22'23.99"E	Intact forest, near a lake	1
KD6	21°39'41.53"N	106°22'27.76"E	Intact forest, near a lake	1
KD7	21°39'41.55"N	106°22'19.49"E	Intact forest, near a lake	0
KD8	21°39'44.28"N	106°22'15.65"E	Intact forest, near a lake	0
KD9	21°39'37.35"N	106°22'10.35"E	Intact forest, near a lake	3

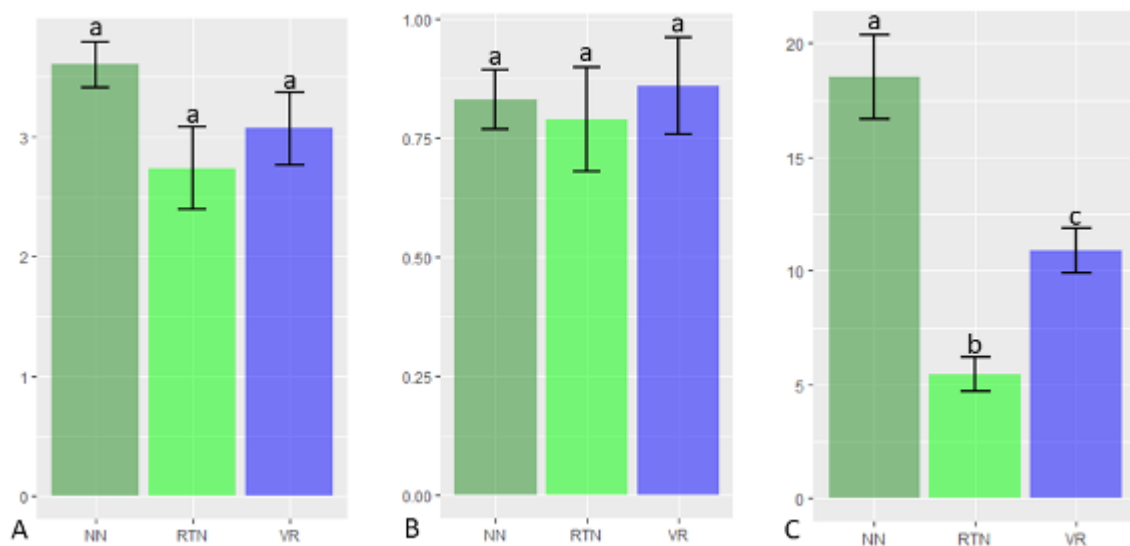
KD10	21°39'38.06"N	106°22'4.41"E	Intact forest, near a lake	0
Lanty 1	21°39'38.00"N	106°22'46.00"E	Disturbed forest	0
Lanty 2	21°39'39.89"N	106°22'47.66"E	Disturbed forest	0
Lanty 3	21°39'41.76"N	106°22'45.36"E	Disturbed forest	0
Lanty 4	21°39'44.88"N	106°22'44.60"E	Intact forest	2
Lanty 5	21°39'45.18"N	106°22'35.59"E	Intact forest	2
Lanty 6	21°39'51.73"N	106°22'34.83"E	Intact forest	1
Lanty 7	21°39'51.81"N	106°22'45.21"E	Disturbed forest	0
Lanty 8	21°39'52.92"N	106°22'53.11"E	Disturbed forest	0
Lanty 9	21°39'58.03"N	106°22'58.78"E	Disturbed forest	0
Lanty 10	21°40'2.92"N	106°23'7.71"E	Disturbed forest	1
Lanty 11	21°38'20.07"N	106°22'38.83"E	Disturbed forest	0
Lanty 12	21°38'26.31"N	106°22'42.44"E	Intact forest	0
Lanty 13	21°38'34.68"N	106°22'46.56"E	Intact forest	1
Lanty 14	21°38'40.81"N	106°22'55.46"E	Disturbed forest	0
Lanty 15	21°38'49.86"N	106°23'6.56"E	Intact forest	4
Lanty 16	21°38'56.15"N	106°22'56.95"E	Disturbed forest	1
BacMo1	21°40'45.18"N	106°23'6.03"E	Disturbed forest, near Bac Mo Dam	0
BacMo2	21°40'44.48"N	106°23'13.15"E	Disturbed forest, near Bac Mo Dam	0
BacMo3	21°40'44.71"N	106°23'22.36"E	Intact forest	0
BacMo4	21°40'30.14"N	106°23'18.45"E	Intact forest	1
Lanram 1	21°43'42.29"N	106°23'29.40"E	Disturbed forest	0
Lanram 2	21°43'53.00"N	106°23'29.00"E	Disturbed forest	0
Lanram 3	21°43'59.25"N	106°23'32.76"E	Intact forest	1
Lanram 4	21°44'35.55"N	106°23'52.36"E	Intact forest	1
Lanram 5	21°45'10.24"N	106°23'56.90"E	Intact forest	2
Lanram 6	106°23'22.04"E	106°23'22.04"E	Disturbed forest	1
SB1	21°44'38.00"N	106°22'12.92"E	Disturbed forest	0
SB2	21°44'40.42"N	106°22'13.90"E	Disturbed forest	0
SB3	21°44'43.10"N	106°22'15.49"E	Disturbed forest	0
Lenri 1	21°38'49.17"N	106°17'36.40"E	Disturbed forest	0
Lenri 2	21°40'36.25"N	106°16'45.74"E	Intact forest	0
Lenri 3	106°16'25.78"E	106°16'25.78"E	Disturbed forest	0
Lenri 4	21°38'59.03"N	106°15'29.78"E	Disturbed forest	0
DL1	21°41'47.67"N	106°21'38.72"E	Grassland + stream	0
DL2	21°41'44.60"N	106°21'35.51"E	Grassland + stream	0
DL3	21°41'40.58"N	106°21'33.85"E	Grassland + stream	0
DL4	21°41'36.56"N	106°21'29.77"E	Grassland + stream	0
DL5	21°41'27.80"N	106°21'26.57"E	Grassland + stream	0
DL6	106°21'25.54"E	106°21'25.54"E	Grassland + stream	0
DL7	21°41'16.05"N	106°21'25.26"E	Grassland + stream	0
DL8	106°21'18.70"E	106°21'18.70"E	Grassland + stream	0
DL9	21°41'0.34"N	106°21'8.58"E	Grassland + stream	0
DL10	21°40'57.20"N	106°20'57.20"E	Grassland + Lake	0



**Figure 1-A.** *Atrocalopteryx atrocyana* (Female). © Bui Dinh Duc. **Figure 1-B.** *Atrocalopteryx atrocyana* (male). © Phan Quoc Toan.

**c)** We have elucidated the species diversity and community structure of Odonata species in various habitat types, natural forest stream (RTN), agriculture stream (NN), and forest edge stream (VR). The analysis of variance (ANOVA) revealed that while there was no statistically significant difference in the number of dragonfly species ( $F = 1.3$ ,  $p = 0.07$ ) and species diversity (Shannon index,  $F = 1.6$ ,  $p = 0.09$ ), there was a notable disparity in the number of individuals ( $F = 6.3$ ,  $p < 0.02$ ) across the three habitat types, RTN, NN, and VR.

Tukey (HSD) analysis further illuminated the disparities. NN exhibited the highest number of individuals, followed by VR. RTN, on the other hand, presented the lowest number of individuals collected (Figure 2).

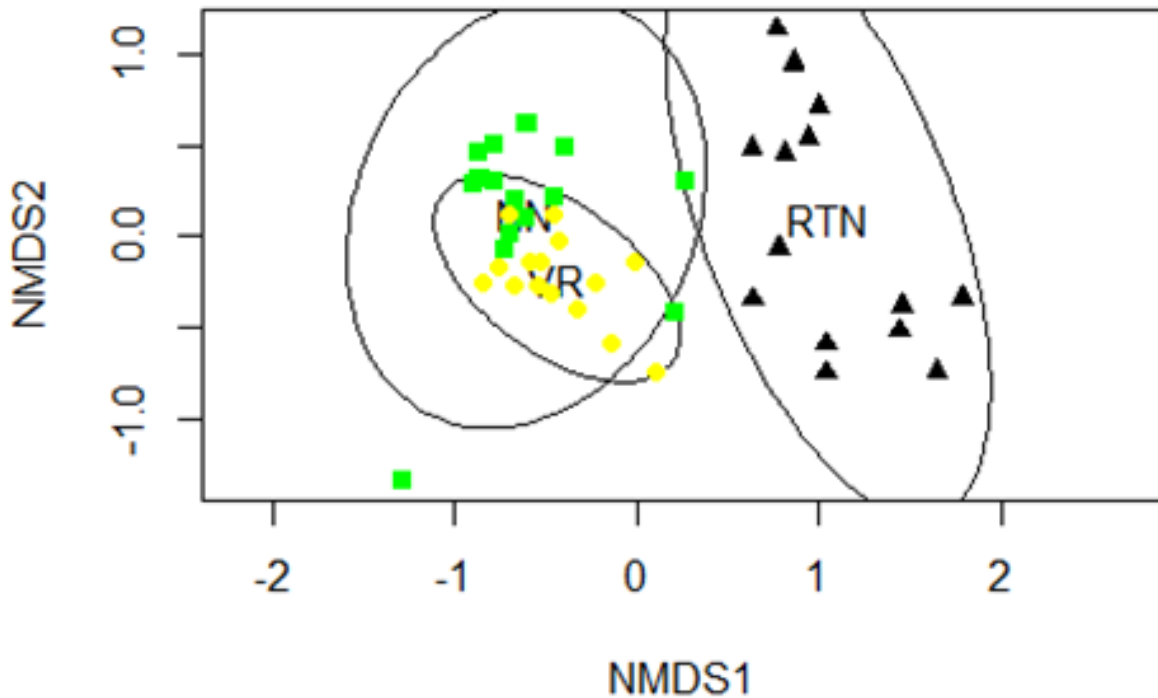


**Figure 2.** Error Bars depicting species richness (Figure 1-A), Shannon diversity index (Figure 1-B), and abundance (1-C) in three habitats: natural forest stream (RTN), agriculture stream (NN), and forest edge stream (VR) within Huu Lien Nature Reserve. Distinct letters signify statistically significant differences at  $p < 0.05$ . Error Bars without common letters are considered significantly different ( $p < 0.05$ ).

While there was no discernible difference in Odonata species diversity among the examined habitat types, Nonmetric Multidimensional Scaling (NMDS) revealed a



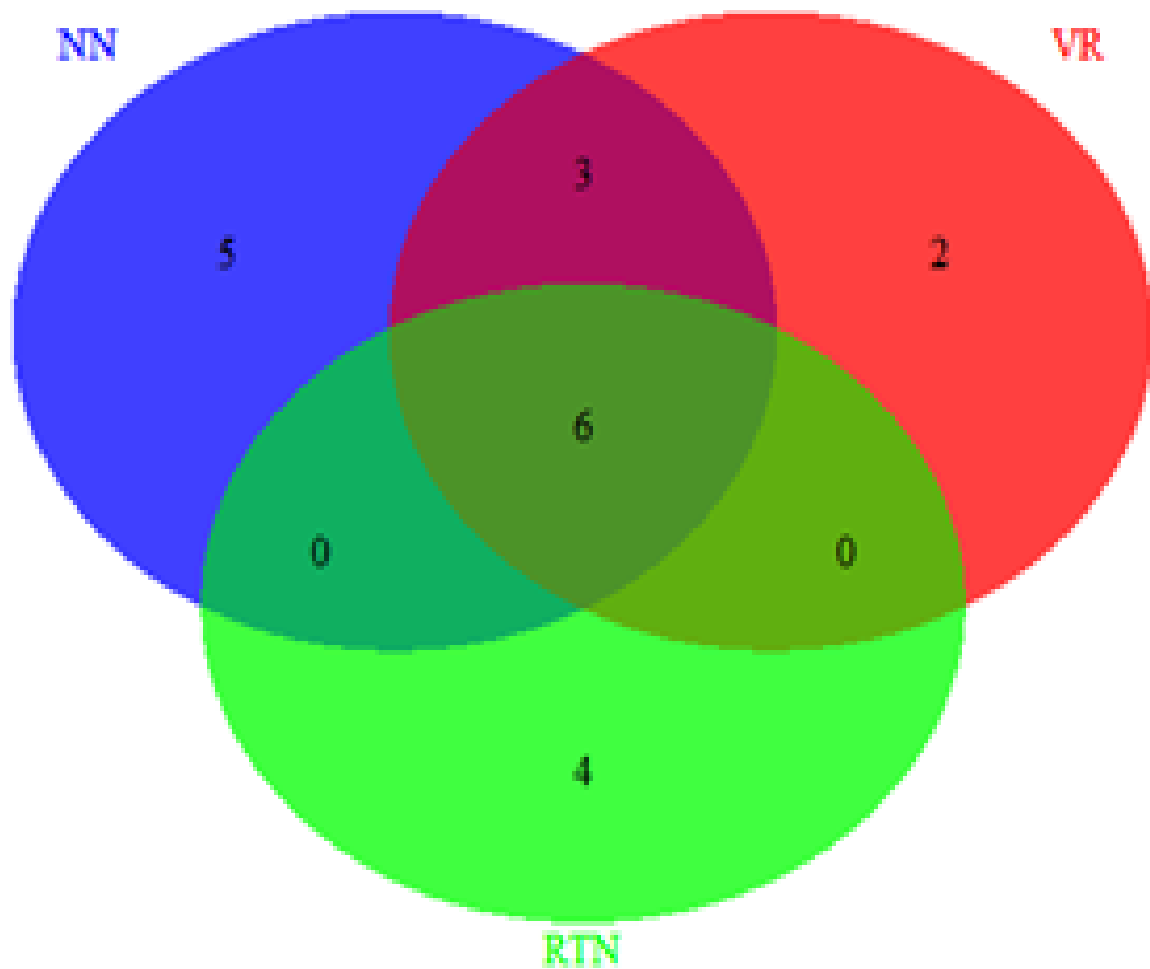
significant separation in dragonfly communities across the three investigated habitat types (Figure 3). The results of Permutational Multivariate Analysis of Variance (PERMANOVA) indicated statistically significant differences in dragonfly community structure between the habitat types (PERMANOVA,  $F=15.8$ ;  $p < 0.001$ ).



**Figure 3.** NMDS analysis showing differences in dragonfly community structure between three habitat types: agricultural streams (NN, green), forest edge streams (VR, yellow) and natural forest streams natural (RTN, black).

The variation in community structure can be attributed to certain dragonfly species exhibiting a limited range of activity within specific habitats. The Venn diagram (Figure 4) illustrates that only six dragonfly species were present in all three habitat types during the survey. In contrast, five dragonfly species were exclusively recorded in agricultural habitats (NN), and four species were solely documented in natural forests (RTN). Additionally, the forest edge habitat recorded two distinctive dragonfly species.

The results of the indicator species analysis, following the approach of Dufrene & Legendre (1997), pinpointed two dragonfly species, *Atrocalopteryx atrocyana* ( $p < 0.001$ ) and *Euphaea masoni* ( $p = 0.020$ ), as indicator species for natural forest habitats.



**Figure 4.** Venn diagram depicting the distribution of dragonfly species recorded in three habitat types: agricultural stream (NN), forest edge (VR), and natural forest (RTN).

**3. Explain any unforeseen difficulties that arose during the project and how these were tackled.**

a. Taxonomic Challenges:

*Difficulty:* Some dragonfly and damselfly species pose challenges in accurate identification, potentially leading to misclassifications in the data. Particularly, some Odonata species are difficult to identify in the field.

*Tackling the Issue:* In response to this challenge, we collect and temporarily house these species in a falcon tube, allowing for thorough examination in the lab before releasing them back into their original habitat. We collaborated with Dr. Phan Quoc Toan, a taxonomic expert specialising in Vietnamese Odonata for identifying species. Dr. Phan has conducted assessments of the conservation status for more than 20 Odonata species for inclusion in the IUCN Red List of Threatened Species™. These assessments include the two Odonata species in our current study: *Atrocalopteryx atrocyana* and *Atrocalopteryx coomani*.

**Reference:**

Phan, Q. 2020. *Atrocalopteryx atrocyana* (amended version of 2011 assessment). The IUCN Red List of Threatened Species 2020: e.T167453A176079575. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T167453A176079575.en>

Phan, Q. 2018. *Atrocalopteryx coomani* (amended version of 2011 assessment). The IUCN Red List of Threatened Species 2018: e.T167411A126899432. <https://dx.doi.org/10.2305/IUCN.UK.2011-1.RLTS.T167411A126899432.en>.



**Figure 5-A.** Dr. Phan Quoc Toan (holding a camera) and Ngo Quoc Phu (Local people) investigating odonata species. **Figure 5-B.** Dr. Phan Quoc Toan (standing second from the left, alongside the research team) actively contributes to field surveys.



**Figure 5-B.** Keep odonata species in the falcon tube for identification in the lab.

b. Community Resistance:

Challenge: Local communities, especially ethnic minorities residing around the Huu Lien Nature Reserve, exhibit resistance to the research, possibly stemming from misunderstandings or concerns about the project's impact on their daily lives.

Approach: To address this challenge, we implemented community outreach programmes, elucidating the advantages of the research for biodiversity. Additionally, we explored the possibility of involving community members in data collection to instill a sense of ownership.

c. Limited Access to Remote Areas:

Challenge: Difficulty in accessing specific remote or karst areas with steep mountains within the Huu Lien Nature Reserve.

Approach: To overcome this obstacle, we collaborated with local guides familiar with the terrain to navigate challenging areas. Specifically, we sought guidance from my colleagues who have undertaken projects funded by Rufford, such as Dr. Bui Van Bac, Mr. Tran Van Dung, and Mr. Phan Viet Dai. They shared invaluable and unique experiences and skills related to surveying karst ecosystems in the Huu Lien Nature Reserve.

**4. Describe the involvement of local communities and how they have benefited from the project.**

A total of 50 local residents and park staff participated in training courses focused on the diversity and conservation of dragonflies and damselflies. From this group, three individuals underwent intensive training and actively participated in our field surveys. These individuals acquired comprehensive knowledge about the biodiversity and conservation significance of Odonata species.

During the training, they learned essential skills, including how to select appropriate survey sites, establish survey transects, and conduct the conservation-minded search and collection of odonata species. Furthermore, they were guided in the proficient use of field equipment such as GPS and cameras. Additionally, these trained individuals actively engaged in assessing the threats posed by human activities within the Huulien Nature Reserve.





Workshops on dung-beetle conservation.



Field training course to dung-beetle sampling.

**Figure 6.** Project activities involved local communities.

### **5. Are there any plans to continue this work?**

Yes. We are in the process of planning surveys for Odonata species in high-elevation mountains, given their heightened vulnerability to the impacts of climate change.

### **6. How do you plan to share the results of your work with others?**

We disseminated the outcomes of the project to both local communities and the management team of the Huu Lien Nature Reserve through a comprehensive approach, including presentations, seminars, and a conclusive report.

Furthermore, we contributed to the academic community by publishing the project results in the Proceedings of the 11<sup>th</sup> Vietnam National Conference on Entomology.

To extend our impact and foster knowledge sharing, we incorporated the project findings into our lectures on insects at the Vietnam National University of Forestry, engaging with students to ensure a wider dissemination of valuable insights.

### **7. Looking ahead, what do you feel are the important next steps?**

Conducting expanding surveys of the endangered Odonata species in the adjacent areas of the Huu Lien Nature Reserve, particularly high elevation karst

ecosystems to evaluate the impact of climate changes on the distribution and population status of the endangered species.

**8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?**

I incorporated the Rufford Foundation logo onto t-shirts distributed among local stakeholders. Additionally, the logo was integrated into presentations delivered at seminars and training courses. Moreover, a prominently displayed banner on Odonata conservation, featuring the foundation's logo, was installed at the entrance of the ecotourism centre in Huu Lien Commune.

To enhance awareness, we actively introduced our colleagues and local conservationists to The Rufford Foundation throughout the course of our work.



**9. Provide a full list of all the members of your team and their role in the project.**

**Bui Dinh Duc** (buiducvnuf@gmail.com), Project Leader

**Le Thai Son** (lethaisonvnuf@gmail.com), Team Member, Field Surveyor, and Data Analyst

**Nguyen Van Ly** (thienlyddsh@yahoo.com), Team Member, Field Surveyor

**Phan Quoc Toan** (pqtoan84@gmail.com), Expert in the Identification of Odonata Species

**Mr. Hoang Doan Phu** (Forest Ranger at the Huu Lien Nature Reserve), Field Surveyor

**Mr. Trieu Van Su** (Local Resident), Field Surveyor

**Mr. Hoang Van Thinh** (Local Resident), Field Surveyor

**Mr. Trinh Van Thanh**, Field surveyor

### 10. Any other comments?

I wish to extend my sincere gratitude to The Rufford Foundation for providing crucial financial support for conducting this work. Your assistance is invaluable in contributing to the early growth of my career in nature conservation.

### Field investigation at Huu Lien Nature Reserve



**Left:** Project team members at the Huu Lien NR. **Right:** Investigating Odonata along the stream within primary forests.



Investigating Odonata in meadows.



**Left:** Investigating Odonata along the stream within primary forests. **Right:** Investigating Odonata along the stream within primary forests.



Investigating Odonata along the stream within agricultural areas.





*Neurobasis chinensis* - female



*Neurobasis chinensis* - male



*Pseudagrion* sp. - male



*Agriocnemis femina* - male



*Atrocalopteryx atrocyana* - female



*Trithemis aurora* - male



*Vestalis gracilis* - female



*Orthetrum pruinosum* - male



*Anax guttatus* - male



*Heliocypha perforata* - male



*Orthetrum sabina* - male



*Orthetrum glaucum* - male



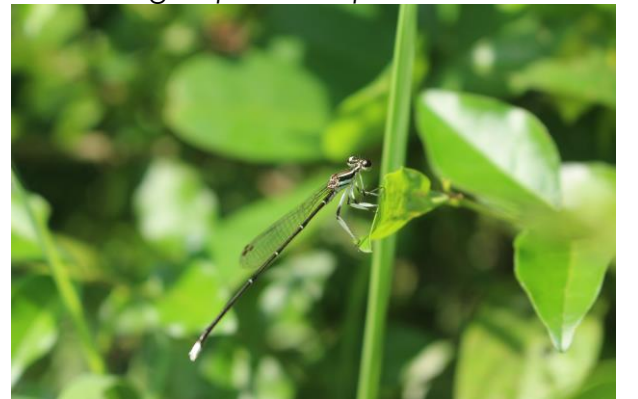
*Neurobasis chinensis* - male



*Trigomphus kompieri*- male



*Paracercion calamorum* - male



*Pseudocoperia ciliata* - male



*Pseudagrion pruinatum* - female



*Diplacodes trivialis* - female



*Vestalis gracilis* - female



*Neurobasis chinensis* - male