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Species Composition and Distributional Characteristics of Freshwater Decapod Crustaceans (Crustacea: Decapoda) and Molluscs (Mollusca) in Xuan Son National Park, Phu Tho Province

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Abstract: The present study has recorded 32 species, 22 genera and 14 families of freshwater decapod crustaceans and molluscs in Xuan Son National Park. Eight species were new additions to the list of species known from this National Park, one of them was recorded from Vietnam for the first time, *Bithynia funiculata* Walker, 1927. Among 14 families, four were decapod crustaceans, and 10 were molluscs. Decapoda was found with seven species (accounted for 21.9% of the total species number), and four genera (accounted for 18% of the total genus number found in the area), while Mollusca was found with 25 species (78.1%) and 18 genera (82%). There was no significant difference in the number of species among different habitats.

Keywords: Decapoda, Mollusca, composition, distribution, Xuan Son.

1. Introduction

Based on field survey in 2013, the previous study by Nguyen Thanh Son et al. (2014) reported 24 species of freshwater decapod crustaceans (Crustacea: Decapoda) and molluscs (Mollusca) in Xuan Son National Park (NP) [1]. Subseqently, we have conducted more field surveys on the aquatic invertebrate biodiversity in the area.

The present paper provides the results of our analysis on the composition and distributional characteristics of decapod crustaceans and molluscs in waterbodies in Xuan Son NP based on the samples from recent field surveys.

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2. Materials and methods

Field surveys were conducted in August 2014, May 2015, August 2015, and May 2016 in 19 sampling sites, as listed below and in Figure 1.

TS1: Xuan Son, Xoan stream, Lung Mang area.

TS2: Xuan Son, A stream by the road, Lung Mang area.

TS3: Kim Thuong, Tan Ong stream, at Chin Tang waterfall.

TS4: Kim Thuong, Tan Ong stream, site 2, ca. 2km from Chin Tang waterfall.

TS5: Kim Thuong, Tan Ong stream, site 2, ca. 4km from Chin Tang waterfall.

TS6: Kim Thuong, Ha Bang stream, near the confluence with Xoan stream.

TS7: Kim Thuong, Xoan stream, near the confluence with Ha Bang stream.

TS8: Kim Thuong, Chieng stream, near ranger station.

TS9: Kim Thuong, Xoan stream.

TS10: Kim Thuong, Ha Bang stream.

TS11: Lap stream, at Ngoc waterfall.

TS12: Lap stream, 1st concrete bridge from Ngoc waterfall.

TS13: Lap stream, 2nd concrete bridge from Ngoc waterfall.

TS14: Đong Son, Than stream.

TS15: Đong Son, Than stream.

TS16: Đong Son, Than stream.

TS17: Ban Coi, Coi stream, by the road to Tan Son.

TS18: Ban Coi, Coi stream, near bridge.

TS19: Ban Coi, Coi stream, water from underground.

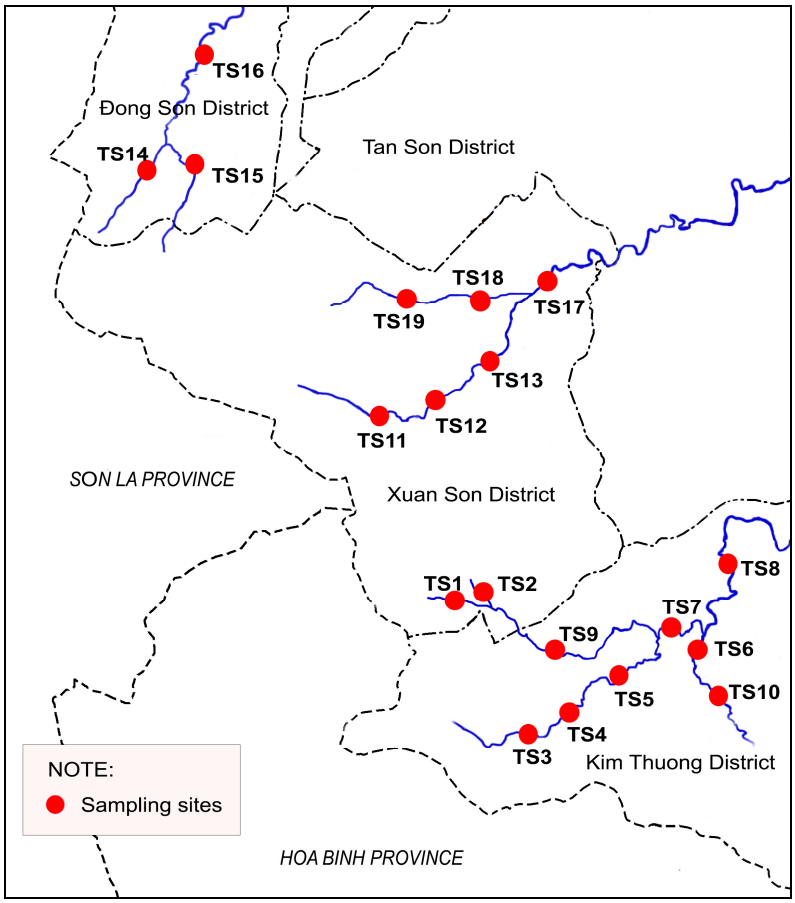

Figure 1. Location of sampling sites in Xuan Son NP.

Specimens were collected by using pond nets and hand nets according to the methods illustrated by Nguyen Xuan Quynh et al. (2004) [2]. In addition, specimens of crabs and snails were also spotted by turning rocks at bottom of streams and collected by hands.

In the field, specimens were preserved in 70% alcohol. Specimens were then labelled and stored in the laboratory of the Department of Invertebrate Zoology, Faculty of Biology, University of Science (VNU, Hanoi) for further studies. Identification of specimens followed taxonomic publications of respective taxa [2-7].

3. Results and discussion

Recent field surveys in Xuan Son NP have resulted in the records of 32 species of decapod crustaceans and molluscs. The survey results have added eight more species to the list of decapod crustaceans and molluscs known from this NP. Among them, one species was recorded from Vietnam for the first time, *Bithynia funiculata* Walker, 1927 (a gastropod); other seven additions included one decapod species, *Somanniathelphusa sinensis*, and six mollusc species, namely *Antimelania siamensis*, *Sulcospira proteus*, *Bithynia misella*, *Bithynia funiculata*, *Lithoglyphus tonkinianus*, *Polypylis hemisphaerula*, and *Corbicula messageri*. Most of species found in the area are common taxa in northern Vietnam.

3.1. Species composition of decapod crustaceans and molluscs

The 32 species of decapod crustaceans and molluscs found in the studied area belong to 22 genera and 14 families as showed in Table 1.

Among these 14 families, four were decapod crustaceans (Crustacea: Decapoda), and 10 were molluscs (Mollusca: Gastropoda & Bivalvia).

At the generic level, Decapoda (Crustacea) was represented by four genera (accounted for 18% of the total genus number), while Mollusca was represented by 18 genera (82% of the total genus number). The family Thiaridae was the most diverse group with seven genera (31.8% of the total genus number). The remaining families were represented by only one or two genera each. In the studied area, Bivalvia was the least diverse group with only two species of the same genus, *Corbicula* (family Corbiculidae).

At the species level, among 32 species identified, the decapod crustaceans were represented by seven species (made up 21.9% of the total species number), while molluscs were found with 25 species (78.1%). Thiaridae was the family with the highest number of species, nine species (28.1% of the total species number). Other families were found with only one to three species each.

The results above have showed that in Xuan Son NP, the molluscs were far more diverse than the decapod crustacneas, with much higher number of taxa. Among the mollusc families, Thiaridae was the most diverse one. The findings agreed well with Đang Ngoc Thanh's (1980) remarks on the Gastropoda biodiversity in streams of northern Vietnam [8].

3.2. Distribution of Crustacea and Mollusca species by habitats

Specimens for this study were collected from 19 sampling sites in two times of the year, May and August. These sampling sites could be classified into three main kinds of habitats: (1) streams in primary forest, (2) streams in secondary forest or planted forest, (3) streams outside forest, near rice paddy and villages.

Data on species distribution according to kinds of habitats are showed in Table 2.

Most decapod crustaceans and molluscs recorded in Xuan Son NP have wide distribution and common in northern Vietnam's water bodies.

On the distribution according to different habitats, the results showed that there were only few differences in species composition of three kinds of habitats. Habitat 1 and Habitat 2 had a same number of species (27 species), and Habitat 3 had 28 species. This showed that most decapod crustaceans and molluscs in Xuan Son NP distributed evenly. It seemed that the distributions of these invertebrate groups were not significantly affected by the conditions of the kinds of habitats in Xuan Son NP. In other words, the habitat conditions of the 19 sampling sites in Xuan Son NP, although had some differences, but they were still at the safe level for the lives of decapod crustaceans and molluscs. Therefore, 20 out of 32 species were found in all three habitats, 10 species were found in two habitats and only one species was encountered in one habitat.

Table 1. The number and corresponding percentage of genera and species in the studied area

No.	Family	Genus	Number of genera	Percentage	Number of species	Percentage
	ARTHROPODA: CRUSTACEA					
1	Atyidae	*Caridina*	1	4.5	3	9.4
2	Palaemonidae	*Macrobrachium*	1	4.5	2	6.3
3	Potamidae	*Indochinamon*	1	4.5	1	3.1
4	Parathelphusidae	*Somanniathelphusa*	1	4.5	1	3.1
5	MOLLUSCA: GASTROPODA					
6	Littorinidae	*Cremnoconchus*	1	4.5	1	3.1
7	Pachychilidae	*Semisulcospira*	1	4.5	1	3.1
8	Stenothyridae	*Stenothyra*	1	4.5	2	6.3
9	Thiaridae	*Antimelania* *Brotia* *Melanoides* *Stenomelania* *Tarebia* *Thiara*	7	31.8	9	28.1
10	Viviparidae	*Sulcospira* *Angulyagra* *Idiopoma*	2	9.1	2	6.3
11	Họ Bithyniidae	*Bithynia*	1	4.5	2	6.3
12	Lithoglyphidae	*Lithoglyphus*	1	4.5	1	3.1
13	Lymnaeidae	*Lymnaea*	1	4.5	2	6.3
14	Planorbidae	*Gyraulus* *Polypylis*	2	9.1	3	9.4
15	MOLLUSCA: BIVALVIA					
16	Corbiculidae	*Corbicula*	1	4.5	2	6.3
Total			**22**	**100**	**32**	**100**

Table 2. Species distribution of Decapoda and Mollusca in Xuan Son NP based on habitats

Species No.	Taxon	Habitat 1	Habitat 2	Habitat 3
	ARTHROPODA: CRUSTACEA: DECAPODA			
	1. Atyidae			
1	*Caridina caobangensis* Li & Liang, 2002	+	+	+
2	*Caridina flavilineata* Dang, 1975	+	+	+
3	*Caridina vietriensis* Dang & Do, 2007	+	+	+
	2. Palaemonidae			
4	*Macrobrachium nipponense* (de Haan, 1849)	+	+	+
5	*Macrobrachium vietnamense* Dang, 1972	+	+	+
	3. Potamidae			
6	*Indochinamon bavi* Naruse, Nguyen & Yeo, 2011	+	+	+
	4. Parathelphusidae			
7	*Somanniathelphusa sinensis* (H. Milne-Edwards, 1853)			+

	MOLLUSCA: GASTROPODA			
	5. Littorinidae			
8	*Cremnoconchus messageri* Bavay & Dautzengerg, 1900	+	+	+
	6. Pachychilidae			
9	*Semisulcospira aubryana* (Heude, 1888)	+	+	+
	7. Stenothyridae			
10	*Stenothyra messageri* Bavay & Dautzenberg, 1900	+	+	+
11	*Stenothyra* sp.	+	+	
	8. Thiaridae			
12	*Antimelania costula* Rafinesque, 1833	+	+	+
13	*Antimelania siamensis* (Brot, 1896)		+	+
14	*Brotia pagodula* (Gould, 1847)	+		
15	*Brotia pseudoasperata* Brandt, 1968	+	+	+
16	*Melanoides tuberculatus* (Müller, 1774)	+	+	+
17	*Stenomelania reevei* (Brot, 1874)	+	+	+
18	*Tarebia granifera* (Lamarck, 1822)	+	+	+
19	*Thiara scabra* (Müller, 1774)	+	+	+
20	*Sulcospira proteus* (Bavay & Dautzenberg, 1910)	+	+	
	9. Viviparidae			
21	*Angulyagra polyzonata* (Frauenfeld, 1862)		+	+
22	*Idiopoma umbilicata* Lea, 1856	+	+	+
	10. Bithyniidae			
23	*Bithynia misella* (Gredler, 1884)	+		+
24	*Bithynia funiculata* Walker, 1927*	+	+	
	11. Lithoglyphidae			
25	*Lithoglyphus tonkinianus* Bavay & Dautzenberg, 1898	+		+
	12. Lymnaeidae			
26	*Lymnaea swinhoei* Adams, 1866		+	+
27	*Lymnaea viridis* Quoy & Gaimard, 1833		+	+
	13. Planorbidae			
28	*Gyraulus convexiusculus* (Hutton, 1849)	+	+	+
29	*Gyraulus heudei* (Clessin, 1886)	+	+	+
30	*Polypylis hemisphaerula* (Benson, 1942)	+	+	+
	MOLLUSCA: BIVALVIA			
	14. Corbiculidae			
31	*Corbicula blandiana* Prime, 1867	+	+	+
32	*Corbicula messageri* Bavay & Dautzenberg, 1901	+		+

Note: Habitat 1: stream in primary forest; Habitat 2: stream in secondary forest;
Habitat 3: stream outside of forest, near rice paddy and village; +: present of species; *: new record for Vietnam

There were 26 species encountered in both May and August collections, the remaining six species were only found in either May or August. These six species could be uncommon in Xuan Son NP, as only few individuals of these species were collected during the surveys.

4. Conclusion

This study has updated the checklist of aquatic decapod crustaceans and molluscs in Xuan Son NP to 32 species, of 22 genera and 14 families. Eight species were new additions to the list of species known from this NP, one of them was recorded from Vietnam for the first time, *Bithynia funiculata* Walker, 1927. Species composition of these invertebrates shows that in 14 families collected, the majority were molluscs with 10 families, while the number of decapod crustacean families was four. Among the 22 genera, only four belonged to Decapoda (18% of all genera), Mollusca made up the higher percentage, with 18 genera (82% of the total genus number). At species level, there were seven species were crustacean decapods (21.9% of the total species number), the rest 25 species are molluscs (78.1%). On the distribution of those groups, the data showed no significant differences between habitats. Habitat 1 and Habitat 2 both had 27 species, Habitat 3 had 28 species.

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Cấu trúc thành phần loài và phân bố của Giáp xác mười chân (Crustacea: Decapoda) và Thân mềm (Mollusca) nước ngọt ở Vườn Quốc gia Xuân Sơn, tỉnh Phú Thọ

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Tóm tắt*:* Kết quả nghiên cứu đã xác định được tại các thủy vực ở VQG Xuân Sơn, tỉnh Phú Thọ có 32 loài Giáp xác mười chân và Thân mềm thuộc 22 giống, 14 họ. Nghiên cứu đã ghi nhận thêm 8 loài cho VQG Xuân Sơn, trong đó có 1 loài lần đầu tiên được ghi nhận ở Việt Nam: *Bithynia funiculata* Walker, 1927. Trong số 14 họ đã gặp, Giáp xác có 4 họ, Thân mềm có 10 họ. Trong tổng số 22 giống đã gặp, Giáp xác có 4 giống chiếm 18% tổng số giống, còn Thân mềm có 18 giống, chiếm 82% tổng số. Ở bậc loài, trong tổng số 32 loài, giáp xác có 7 loài chiếm 21,9%, Thân mềm có 25 loài chiếm 78,1%. Kết quả cho thấy không có sự sai khác đáng kể nào về số lượng loài bắt gặp ở các dạng sinh cảnh.

Từ khóa: Cấu trúc, phân bố, Giáp xác Mười chân, Thân mềm, Xuân Sơn.