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SPECIES COMPOSITION AND DISTRIBUTION OF PALAEMONID SHRIMPS FROM PHU THO PROVINCE

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Abstract

To clarify species composition and distribution of the freshwater shrimps of Palaemonidae family in Phu Tho Province, collections were conducted in typical habitats of Red River, Da River, Chay River, Lo River, Bua River and some streams, ponds and lakes from July 2019 to March 2020 (7-8/2019, 11-12/2019, and 2-3/2020). Two shrimp species *Macrobrachium nipponense* and *Macrobrachium yeti* were collected. Of which, the former species occurred in all collection sites, while the latter was distributed only in Da river basin. These two species are facing with the risks of declining quantity in nature. The results are a useful addition of information of status of freshwater shrimps, which will be important to the development and implementation of management plans of aquatic resources in which *M. nipponense* showed a high culture potential in Phu Tho.

Keywords: Shrimp, species composition, distribution, Palaemonidae, Phu Tho.

1. Introduction

The family Palaemonidae belonging to the order Decapoda and the class Natantia has both high biodiversity and commercial important. They play an important role as the domestic fisheries for freshwater prawn regions of Northern Vietnam in general and of Phu Tho province in particular. In economic aspect, by catching and harvesting some species of the Palaemonidae which have important economic values in the tropics and subtropics in Asia Pacific as well as Vietnam supplies tasty abundantly

nutrients-rich foods. Additionally, they are also an important link of food chains in the benthic fauna ecosystem. The Palaemonidae distributes in almost domestic waters such as rivers, lakes, lagoons and flooded fields [1-4].

Phu Tho has a water surface area of 10,500 ha with tens of billions of cubic meters of water. In biogeographical aspect, this is delta and low hill and mountain area with all freshwater ecosystems, especially the densely distributed stream network that creates a diverse and distinctive water

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ecosystem. Fauna diversity is high with aquatic species, typically characterized for water bodies in delta and low hill and mountain areas with a yield of about 25,000 tons. This shows a potentially economic value of aquatic species and also freshwater shrimps [5].

There were previous study on crustacean species composition in Xuan Son National Park and some locations in the Red river of Phu Tho province [6-8]. However, other waters have not been examined. This study was aimed to supply the database on species composition and distribution of the Palaemonid shrimps. The information will be crucial to establish sustainable development solutions for freshwater shrimps or selecting species in order to culture this highly economic value aquatic species in Phu Tho and adjacent regions.

2. Methods

2.1. Sampling methods

a. Sampling habitats: Based on the method of dividing surface-water bodies on ground of Dang Ngoc Thanh et al. [9, 10], Phu Tho has main water bodies consisting of rivers, streams, ponds and lakes. The prawn specimens were collected in these water bodies including: Red river in Ha Hoa district and Phu Tho town, Da river in Thanh Thuy and Tam Nong districts, Chay river in Doan Hung district, Lo river in Phu Ninh district, Bua river in Thanh Son district, streams in Tan Son district, and some ponds and lakes in Yen Lap, Cam Khe and Viet Tri.

b. Sampling period: Samples were collected in three periods: the first in rainy

season (July-August 2019), the second and third in dry season (November-December 2019 and February-March 2020). Each period lasted for 3-5 days.

c. Collecting specimens: Shrimps were collected from fishermen using drift-nets, lift-net, large dip nets, fishing cage traps, shrimp cages. Samples were preserved in absolute alcohol and labelled with sample names, times and locations. All specimens were deposited in the laboratory of Hung Vuong Univeristy. Fishermen interviews were also carried out to collect information on shrimp species such as occurring frequencies, catching positions, catching time, quantities, local names.

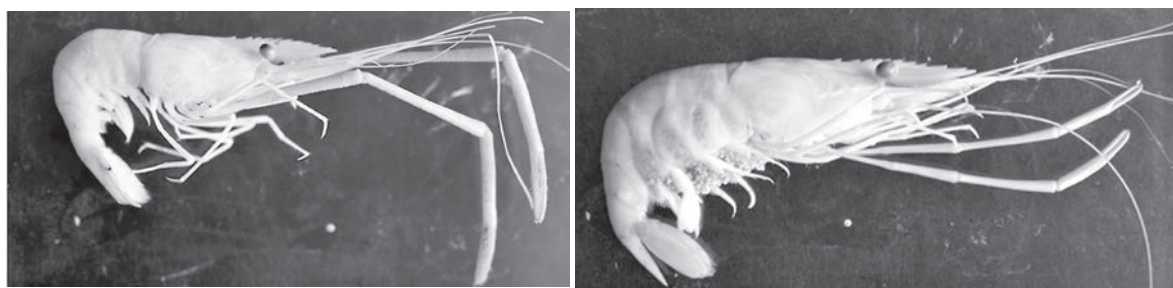
2.2. Species classification methods

Classification of shrimps was based on the external morphology according to Dang Ngoc Thanh et al. [11, 12], and Do Van Tu and Nguyen Tong Cuong [4].

3. Results and discussion

3.1. Species composition of freshwater shrimps in water bodies of Phu Tho province

Two species belonging to the genus *Macrobrachium*, i.e. *M. nipponense* (de Haan, 1849) and *M. yeti* Dang, 1975 from the family Palaemonidae were observed in waters around Phu Tho Province. Thus, after Dang Ngoc Thanh and Ho Thanh Hai [13] there was no new appearance of shrimp species in water bodies of Phu Tho. The ratios of species to genus and of species to family were 0.6 and 1.0, respectively. The species number of the family Palaemonidae in Phu Tho accounted for 4.6% of that in Vietnam (43 species).

(1) *Macrobrachium nipponense* (de Haan, 1849) (Vietnamese name: Tôm càng) (Figure 1)

(a)

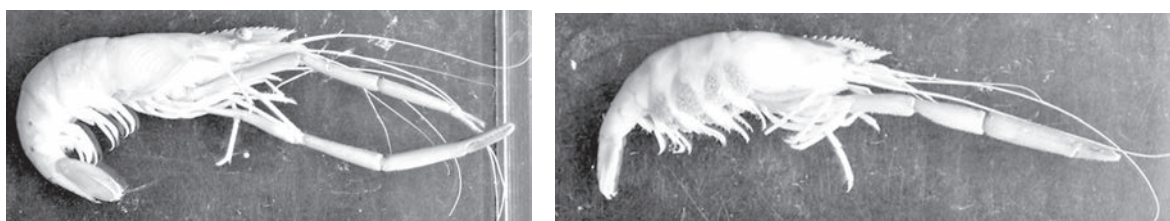
(b)

Figure 1. Morphology of *Macrobrachium nipponense* in Phu Tho province

(a-Male, b-Female)

Description: Large and medium sizes, total length 50-100 mm. The carapace of head thorax part is smooth or rough. Rostrum reaches to or exceeds the antennae II, tip slightly bent upwards. The upper edge has 11-14 spines, 3-4 spines on the carapace of head thorax part. The first spine is far from the second one. The lower edge has 2-6 spines. The second maxillipeds is length,

fingers are smooth in female and rough in male. The ischium of merus is shorter than that of carpus. The shape of ischium of merus is tube and its length by $\frac{4}{3}$ of the propodus. The propodus is tube or swollen. The length of dactylus is by $\frac{3}{5}$ of the propodus. Edge has dense hair in male and sparse in female. Telesol has shape a sharp point. Eggs small, size 0.4-0.6 mm.

(2) *Macrobrachium yeti* Dang, 1975 (Vietnamese name: Tôm càng sông Đà) (Figure 2)

(a)

(b)

Figure 2. Morphology of *Macrobrachium yeti* in Phu Tho province

(a-Male, b-Female)

Description: Medium and small sizes, total length 35-65 mm. The carapace of head thorax part is smooth. Rostrum is broad, pointed in head, and nearly reaching to the end of antennae I. The rostrum has 9-11 spines in dorsal edge (3 teeth on the carapace

of head thorax part) and 1-3 (usually 2) along ventral edge. The second maxillipeds (left and right) are irregular, their fingers are fat and rough in surface. The ischium of merus is little shorter than that of carpus. The shape of of merus is short tube and its length by

2/3-3/4 of the propodus. The propodus is little flat and swollen in the middle. The dactylus is equal or shorter than the propodus. Its edge is sharp and has small spines. Telesol is lengthened into a sharp triangle point.

3.2. Distribution of the two freshwater shrimps in habitats in Phu Tho

Table 1. Distribution of *Macrobrachium nipponense* and *Macrobrachium yeti* in habitats in Phu Tho

No.	Locality	Habitat	M. nipponense			M. yeti		
			Period 1	Period 2	Period 3	Period 1	Period 2	Period 3
1	Thuong Khe - Doan Hung	Chay river	x	x	x			
2	Tinh Tue - Thanh Thuy	Da river	x	x	x	x	x	x
3	Hong Da- Tam Nong	Da river	x	x	x	x	x	x
4	Bang Da - Ha Hoa	Red river	x	x	x			
5	Phu Tho town	Red river	x	x	x			
6	Tien Du - Phu Ninh	Lo river	x	x	x			
7	Thanh Son town	Bua river	x	x	x			
8	Van Khuc - Cam Khe	Pond	x	x	x			
9	Xuan Thuy - Yen Lap	Pond	x	x	x			
10	Van Phu - Viet Tri	Lake	x	x	x			
11	My Thuan -Tan Son	Stream	x	x	x			

Note: x: Occurring species.

Table 1 shows that *M. nipponense* was distributed in almost water bodies of Phu Tho including Red river, Lo river, Da river, Chay river, Bua river, streams, ponds and lakes. *M. yeti* occurred only in Da river basin and was not encountered in other habitats of the study sites. This is similar to the findings of Nguyen Thanh Son *et al.* [7] who investigated streams in Xuan Son National Park, Tan Son district, Phu Tho province. The authors found *M. nipponense* in most streams but not any individual of *M. yeti*. The results of distribution of the two study species in Phu Tho are also corresponding to that of Dang Ngoc Thanh *et al.* [11] which claimed that *M. nipponense* was widely distributed in fresh and brackish waters of the delta, midland and mountainous regions whereas *M. yeti* was encountered only in rivers, streams and underground water caves

in north-western Vietnam (Lai Chau, Son La). It may be suggested that *M. yeti* lives in Da river of Son La province and moves to Da river of Phu Tho. The study results indicated that *M. nipponense* was a dominant species in the different habitats and had a wider distribution than *M. yeti*.

3.3. Conservation status of the two shrimp species

The two study species distributed in Phu Tho were not endemic to Vietnam and not listed in Red Data Book of Vietnam (Table 2). According to IUCN [15], *M. nipponense* is categorized at Least Concern (LC) due to having big body size and wide distribution and occurring in most freshwater bodies of Northern Vietnam and surrounding countries.

By using the expert method to quickly assess the weights of field-collected shrimps, we found that small individuals (below 1g/ind.) accounted for a large fraction (above 50% for *M. nipponense* and over 90% for *M. yeti* depending on locations). Shrimps with weights from 3g/ind. and above made up a low proportion (under 5% for *M. nipponense* and

no individual for *M. yeti*). Local fishermen said that catching frequency is continuous and mainly for commercial purposes. Over-catching methods which collect all individuals are usually used. These make not only shrimps being able to reproduce but also small individuals maintaining population growth and development decrease.

Table 2. Conservation status of *Macrobrachium nipponense* and *Macrobrachium yeti*

No.	Species	Endemic species of study site	Endemic species of Vietnam	Conservation status	
				Red Data Book (2007)	IUCN (2010)
1	<i>M. nipponense</i> (de Haan, 1849)	-	-	-	LC
2	<i>M. yeti</i> Dang, 1975	-	-	-	-

Note: -: No information; LC: Least Concern.

4. Conclusions

The two shrimp species belonging to the family Palaemonidae (*M. nipponense* and *M. yeti*) were identified in typical water bodies of Phu Tho. *M. nipponense* appeared in all habitats whereas *M. yeti* was distributed only in Da river basin. These two species are facing with the risks of declining quantity in nature because of continuous and over catching.

M. nipponense showed a wide adaptation, could adapt to water environment conditions of Phu Tho and had a bigger size than *M. yeti*, suggesting the potential for culturing this species. Therefore, further studies on morphological characteristics, growth, breeding and foods are necessary for aquaculture purposes.

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KHẢO SÁT THÀNH PHẦN LOÀI VÀ HIỆN TRẠNG PHÂN BỐ CỦA TÔM CÀNG HỌ PALAEMONIDAE TẠI TỈNH PHÚ THỌ

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Tóm tắt

Khảo sát thành phần loài tôm càng được tiến hành tại các sinh cảnh điển hình trên các tuyến sông Hồng, sông Đà, sông Chảy, sông Lô, sông Bứa, các suối và một số ao, hồ của tỉnh Phú Thọ vào 3 đợt khác nhau (tháng 7-8/2019, tháng 11-12/2019 và tháng 2-3/2020). Kết quả điều tra đã xác định được 2 loài tôm thuộc giống Macrobrachium, họ Palaemonidae là loài *Macrobrachium nipponense* và loài *Macrobrachium yeti*. Loài *M. nipponense* phân bố rộng hơn và xuất hiện ở tất cả các sinh cảnh, loài *M. yeti* ghi nhận xuất hiện ở lưu vực sông Đà, tuy nhiên không thấy xuất hiện ở các sinh cảnh khác trong khu vực nghiên cứu. Các loài này đang đối mặt với nguy cơ suy giảm số lượng ngoài tự nhiên do bị đánh bắt liên tục và tận thu. Kết quả nghiên cứu là những thông tin có giá trị, làm cơ sở đề ra các biện pháp khai thác, quản lý nguồn lợi thủy sản này một cách hợp lý, trong đó loài *M. nipponense* thể hiện tiềm năng nuôi trồng rất lớn.

Từ khóa: Tôm càng, thành phần loài, phân bố, Palaemonidae, Phú Thọ.