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Triphorid snails in Thai Waters (Gastropoda: Triphoroidea: Triphoridae)

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Abstract. Eighteen genera and forty-four species in three subfamilies of triphorid snails have recorded from sand sediments in the intertidal zone of several beaches and rocky shores in Thai Waters, Thailand. In Andaman sea, 16 genera and 38 species were recorded while 12 genera 21 species found in the Gulf of Thailand and 10 genera and 14 species were recorded from the both Andaman sea and the Gulf of Thailand. All taxa are enlisted as a new record of Thai Waters.

1. Introduction

The edge of coastal areas in Thailand is the joint of two marine biogeographic realms, Western Indo-Pacific, and Central Indo-Pacific, which contain a variety of habitats and tons of marine resources such as coral reef, fishes molluscs, etc. [1]. Focus on kinds of literature, in the Family Triphoridae Gray, 1847, which are small and beautiful marine snail species that normally a few millimeters long [2]. This family usually found lives together with sponges and feed on them. Three subfamilies, Metaxiinae Monterosato, 1884, Iniforinae Kosuge, 1966, and Triphorinae Gray, 1847, are recognized [3, 4]. Member of the subfamily Metaxiinae has a dextral shell coiling while the other two subfamilies, Iniforinae and Triphorinae, have a sinistral shell coiling. The study of this family has been largely neglected because the documents are very poor and the original descriptions are insufficient [5]. Nowadays, more than 150 species in 24 genera were reported in the Indo-Pacific region and nearby countries [6-15]. From the literature reviewed of Thai triphorid species, only six species were reported from the Gulf of Thailand and no reported from the Andaman Sea. They are and four species, *Bouchettriphora pallida* (Pease, 1870) *Viriola corrugata* (Hinds, 1843), *Latitriphora* sp. and *Nanaphora* sp., were reported from clay pit at Petchaburi province by Robba *et al.* in 2003 [16], and are two unidentified triphorid species collected from mudflat in the blackish water were reported by Brandt in 1974. In this paper, we would like to present the species of triphorid snails collected from Thai waters based on shell morphology.

2. Method

Sand sediments were randomly collected from several stations in the intertidal zone in both the Andaman Sea and the Gulf of Thailand (study sites show in Figure 1) by both hand picking and using a 10x10x5 cm³ sampling box. Sand sediments were sieved, using 1.0 and 0.5 millimeters mesh size. Shells were sorted out from sieved sediments under stereomicroscope SZ30 in laboratory and then



cleaned and photographed for identification. The taxonomic identification was done following the literature of Marshall, Laseron, and Okutani [5-7, 10].

Table 1. Study sites.

Station (No. in the map)	Andaman Sea		Station (No. in the map)	The Gulf of Thailand	
	Province	Location		Province	Location
1	Pang-nga	Similan Island, Surin Island	6	Songkhla	Chalatas Beach
2	Phuket	Panwa Cape, Tangkhen Bay	7	Nakhornsri thammarat	Naipiao Beach
3	Krabi	Nopparatthara Beach, Susanhoilanpee, Lanta Island	8	Suratthani	Samui Island, Tao Island
4	Trang	Yongling Beach	9	Chumporn	Koh Talu
5	Stun	Rok Loi Island	10	Prachuapkirikha	Ao Manao
			11	Chonburi	Smaesarn Island, Rad Island, Bangsaen Beach, Captain Yut Beach, Sri Chang Island
			12	Rayong	Koh Mannai
			13	Chantaburi	Kungkabaen Bay

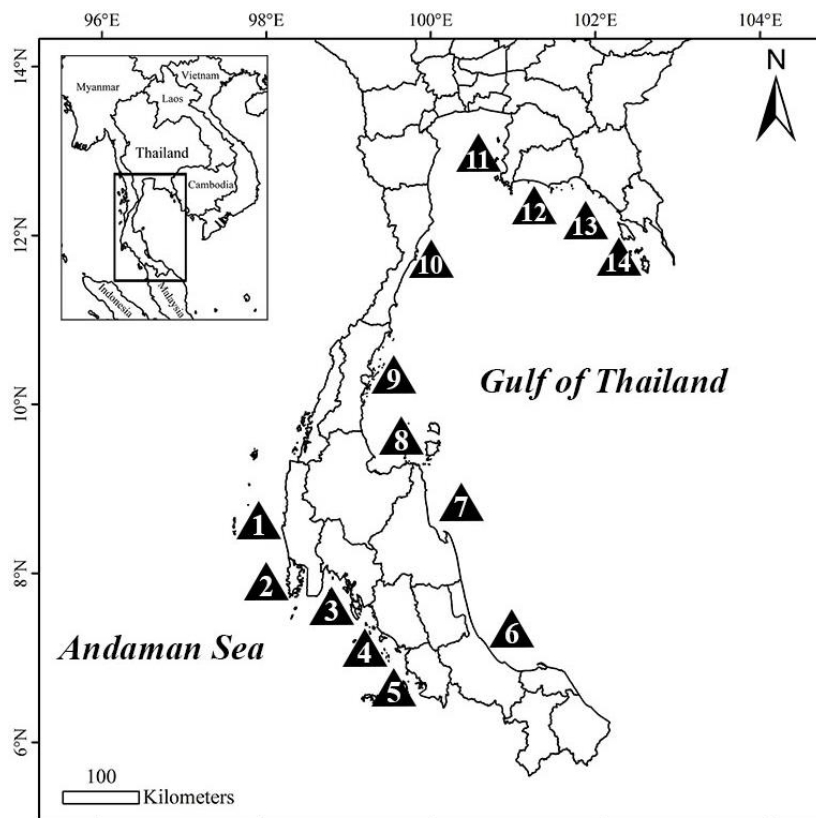


Figure 1. Study sites.

3. Results and discussion

Form the field surveys, Study sites in the Andaman sea are mostly rocky adjacent to the coral reef while the study sites in the Gulf of Thailand are mixed with sandy and rocky shore with coral reef outside. A total of three subfamilies, 18 genera, and 44 species were recorded (Table 2).

Table 2. Species list and its distribution.

No	Taxon	Distribution	
		Andaman Sea	Gulf of Thailand
1	<i>Aclophora xystica</i> (Jousseaume, 1884)		√
2	<i>Bouchettriphora cf. otusensis</i> (Yokoyama, 1920)	√	√
3	<i>Bouchettriphora pallida</i> (Pease, 1870)	√	
4	<i>Coriophora cnodax</i> (Jousseaume, 1884)	√	√
5	<i>Coriophora fusca</i> (Dunker, 1860)	√	√
6	<i>Coriophora monilifera</i> (Hinds, 1843)	√	√
7	<i>Euthymella bilix</i> (Hinds, 1843)	√	
8	<i>Euthymella concors</i> (Hinds, 1843)	√	
9	<i>Euthymella elegans</i> (Hinds, 1843)	√	
10	<i>Inella asperrima</i> (Hinds, 1843)	√	
11	<i>Iniforis formosula</i> (Hervier, 1897)	√	
12	<i>Iniforis fusiformis</i> (Kosuge, 1961)	√	√
13	<i>Iniforis ikukoeae</i> (Kosuge, 1963)	√	
14	<i>Mastonia cf. clavata</i> Pease, 1861		√
15	<i>Mastonia cf. papillata</i> (Hervier, 1897)		√
16	<i>Mastonia cf. undata</i> (Kosuge, 1962)		√
17	<i>Mastonia cingulifera</i> (Pease, 1861)	√	
18	<i>Mastonia lamberti</i> (Hervier, 1897)	√	
19	<i>Mastonia peanites</i> (Jousseaume, 1884)	√	
20	<i>Mastonia rubra</i> (Hinds, 1843)		√
21	<i>Mastonia thetis</i> (Hedley, 1899)	√	√
22	<i>Mastoniaeformis ikukoeae</i> (Kosuge, 1963)	√	
23	<i>Mastoniaeformis jousseaumei</i> (Hervier, 1897)	√	
24	<i>Mastoniaeformis lifunana</i> (Hervier, 1897)	√	
25	<i>Metaxia</i> sp.		√
26	<i>Monophorus atratus</i> (Kosuge, 1962)	√	
27	<i>Monophorus hervieri</i> (Lasseron, 1962)	√	√
28	<i>Monophorus tessellatus</i> (Kosuge, 1963)	√	√
29	<i>Nanaphora pymaeus</i> (Kosuge, 1963)	√	√
30	<i>Nanaphora tricolor</i> (Laseron, 1958)	√	
31	<i>Nanaphora triticea</i> (Pease, 1861)	√	√
32	<i>Obesula turricula</i> (Hervier, 1898)	√	
33	<i>Opimaphora coralina</i> Laseron, 1958	√	
34	<i>Opimaphora sarcira</i> Laseron, 1958	√	√
35	<i>Subulotriphora rutitans</i> (Hervier, 1897)	√	
36	<i>Tetrastoma iniqua</i> (Jousseaume, 1884)	√	√
37	<i>Tetrastoma pallidus</i> (Kosuge, 1962)SEM	√	
38	<i>Triphora taeniolata</i> (Hervier, 1897)	√	
39	<i>Viriola cancellata</i> (Hinds, 1843)	√	
40	<i>Viriola incisa</i> (Pease, 1860)	√	
41	<i>Viriola intergranosa</i> (Hervier, 1897)	√	
42	<i>Viriola tricincta</i> (Dunker, 1860)	√	√
43	<i>Viriola vulpina</i> (Hinds, 1843)	√	√
44	<i>Viriolopsis fallax</i> (Kay, 1979)	√	√

*Remark: √ = species recorded.



Figure 2. Some triphorids recorded from Thai Waters: A) *Aclophora xystica* (Jousseume, 1884), B) *Monophorus hervieri* (Lasseron, 1962), C) *Coriophora cnodax* (Jousseume, 1884), D) *Coriophora fusca* (Dunker, 1860), E) *Euthymella bilix* (Hinds, 1843), F) *Euthymella concors* (Hinds, 1843), G) *Euthymella elegans* (Hinds, 1843), H) *Iniforis fusiformis* (Kosuge, 1961), I) *Mastonia cingulifera* (Pease, 1861), J) *Mastonia cf. clavata* Pease, 1861, K) *Mastonia lamberti* (Hervier, 1898), L) *Mastonia peanites* (Jousseume, 1898), M) *Mastonia rubra* (Hinds, 1843), N) *Mastoniaeforis ikukoae* (Kosuge, 1963), O) *Mastoniaeforis jousseumei* (Hervier, 1898), P) *Mastoniaeforis lifuana* (Hervier, 1898) Q) *Monophorus atratus* (Kosuge, 1962), R) *Nanaphora tricolor* (Laseron, 1958), S) *Nanaphora triticea* (Pease, 1861), T) *Obesula turricula* (Hervier, 1898), U) *Tetrachora iniqua* (Jousseume, 1898), V) *Viriola cancellata* (Hinds, 1843), W) *Viriola tricincta* (Dunker, 1882), X) *Viriolopsis fallax* (Kay, 1979).

Marine microgastropod in the family Triphoridae represents a poorly understudied even at the basic taxonomic and identification levels not only in Thai waters but also in the world because of insufficient literature and type specimen quality. From the field collection, 18 genera and 44 species of 3 subfamilies, Metaxiidnae, Triphorinae, and Iniforinae, were recorded from Andaman sea and the Gulf of Thailand. All are shell grits or empty shells that sorted out from sand sediments collected in the intertidal zone. Six-teen genera and 38 species were recorded from Andaman sea while 12 genera 21 species found in the Gulf of Thailand and 10 genera and 14 species were recorded from the both Andaman sea and the Gulf of Thailand.

From the literature review, the diversity recorded of this family in Thailand is lower than that of nearby countries located in the Indo-Pacific regions like Australia, Philippines, and countries outside regions like Japan, Taiwan, and Hawaii. There are 156 species recorded in Indo-Pacific region, 93 species recorded in Japan, 65 species in Taiwan and 51 species in Hawaii. However, more studying areas and with a consequently larger number of specimens found would give a much higher number of triphorid species living in Thai waters.

4. Conclusion

In this study, 18 genera and 44 species of triphorid snails were recorded from Thai Waters. All taxa are enlisted as a new record of Thai Waters.

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