

**FIRST RECORD OF *Anselmella malacia* Xiao & Huang, 2006 (Hymenoptera: Eulophidae), A NEW INSECT PEST OF WATER APPLE (*Syzygium samarangense*) AND ITS ASSOCIATED PARASITOID IN DONG THAP PROVINCE, VIETNAM**

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**ABSTRACT**

The eulophid wasp, *Anselmella malacia* Xiao & Huang, 2006 (Hymenoptera: Eulophidae), is reared from fruits of the water apple, *Syzygium samarangense*, and is reported as an important phytophagous developing as seed-eaters of *Syzygium* species in Malaysia. Analysing specimens of pest insects infested inside of pear-shaped fruits of the cultivated water apple, *S. samarangense*, in Dong Thap Province, South Vietnam, a total of four insect species were recorded as the important pests for fruits of six varieties of the cultivated water apples. The hymenopteran wasp, *A. malacia*, is recorded for the first time from Vietnam. Further evidence is needed to prove *A. malacia* being an invasive pest in Vietnam. The associated hymenopteran parasitoid assemblage with the fruit infested insect pests is also provided.

**Keywords:** Eulophidae, *Anselmella*, new pest, new record, parasitoid, phytophagous insects, Vietnam.

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## INTRODUCTION

*Syzygium samarangense* Merr. & Perry. (Myrtaceae), commonly known as wax apple, wax jambu, water apple, rose apple or Java apple, has pear-shaped fruits and is common in Cambodia, Laos, Thailand, Taiwan and Vietnam, and is also frequently cultivated in India, Pembe (Tanzania) and Zanzibar (Xiao & Huang, 2006). The water apple is growing in the most provinces in the southern Vietnam. The pear-shaped fruits are often juicy, with a subtle sweet taste somewhat resembling a common apple, and especially, this crop is considered as one of the special precious fruits of Dong Thap Province.

Recently, during several surveys conducted in late March 2019 for revealing parasitoids of fruit flies *Bactrocera* spp. infested the water apple, we recognized a community of hymenopteran wasps inside of the fruits of cultivated water apple in several areas of Dong Thap Province. Among hymenopteran wasp adults, we recorded the eulophid wasp, *Anselmella malacia* Xiao & Huang, which causes a heavy damage to the cultivated water apples in Cao Lanh City and its vicinity.

## MATERIALS AND METHODS

All the specimens examined in this study were collected from water apple fruits in Cao Lanh City, Dong Thap Province, in late March 2019. Since it is rather difficult to obtain reliable estimates of abundance of species inside the cavity of water apple fruits, the relative abundance data are collected by complete enumeration, counting all individuals found in well-defined damaging fruits, then the comparative abundance of insect pests are expressed in percentage.

Identification of pest insects and their associated parasitoids is based on the following literatures: Doganlar & Hassan (2010), Han et al. (2017), Leblanc et al. (2018), Li et al. (2013), Xiao et al. (2006), Yang et al. (2014). *Anselmella malacia* was identified by the comparison of the morphological characters of the pest population collected from six varieties of the

cultivated water apples in Cao Lanh, Dong Thap, with the original description of Xiao et al. (2006). Measurements of *A. malacia* adults were made using a binocular microscope (DK3000; Meiji Techno Co., Ltd., Saitama, Japan).

All the research specimens are deposited in the Institute of Ecology and Biological Resources (Ha Noi, Vietnam) and Dong Thap University (Cao Lanh, Dong Thap, Vietnam).

## RESULTS

### Pest insects associated with the fruit of cultivated water apple, *Syzygium samarangense*

Of the most commonly sampled species, one was a seed-eater of *Syzygium* varieties: *Anselmella malacia* Xiao & Huang (Hymenoptera, Eulophidae), and three others were frugivorous insects, *Bactrocera dorsalis* (Diptera, Tephritidae); *Orgyia postica* (Walker) (Lepidoptera, Erebidae); and *Cydia* sp. (Lepidoptera, Tortricidae) (Table 1).

The seed-eater *A. malacia* and frugivore *B. dorsalis* were found as the most abundant species in the samples (> 50%). Especially, in the fruits of two varieties Hong Dao Da and Hoa An planted in Dong Thap Province, up to 100% of the sampled specimens were of the seed-eater *A. malacia*.

Seeds attacked by the seed-eater *A. malacia* contained cavities and frass made by larvae and were often galled with a mass of pale conductive tissue and parenchyma, rather than green cotyledons (Fig 1). The effect of the seed-eater and other frugivorous insects on the viability of the seed in samples was not quantified. Nevertheless, seedlings were able to germinate from the most severely damaged fruits and seeds by the end of the trial.

Of total five insect species recorded from six varieties of the cultivated *Syzygium samarangense* in Cao Lanh city, Dong Thap Province, in addition to *A. malacia*, we have found another hymenopteran species, *Megastigmus* sp. and two lepidopteran

species, *Orgyia postica* and *Cydia* sp. *Orgyia postica* was reported as the restrictively distributed frugivore in Vietnam (Waterhouse, 1993; CABI, 2019). Another frugivorous insect, *Cydia* sp. is also an abundant pest, i.e. 25–50% of the sampled specimens of the pest complex infested the water apple in Dong Thap Province.

Table 1. Assemblage of pest insects found in fruits of *S. samarangense* in Cao Lanh City and its vicinity

Pest species	Local varieties of <i>Syzygium</i>					
	Xanh Duong	Hong Dao Da	Sua	An Phuoc	Hoa An	Indian
<b>Diptera, Tephritidae</b>						
<i>Bactrocera dorsalis</i> (Hendel, 1912) (oriental fruit fly)	> 50%	> 50%	> 50%	< 25%	> 50%	< 25%
<b>Hymenoptera, Eulophidae</b>						
<i>Anselmella malacia</i> Xiao & Huang, 2006	25–50%	> 50%	25–50%	< 25%	> 50%	-
<b>Torimidae</b>						
<i>Megastigmus</i> sp.						
<b>Lepidoptera</b>						
<b>Erebidae</b>						
<i>Orgyia postica</i> (Walker, 1955) (cocoa tussock moth)	< 25%	25–50%	< 25%	< 25%	25–50%	-
<b>Tortricidae</b>						
<i>Cydia</i> sp.	< 25%	25–50%	-	-	25–50%	-



Figure 1. Healthy water apple fruit (left) and the fruit damaged by *Anselmella malacia* (right)



Figure 2. Damages inside of water apple fruits caused by *Bactrocera dorsalis* Xanh Duong variety (left), Hong Dao Da variety (middle) and Indian variety (right)

**Morphology of *A. malacia* collected from the water apple in Cao Lanh, Dong Thap**

Based on the comparative characters of the wasp seed-eater infested *Syzygium*

*samarangense* in Cao Lanh city, Dong Thap Province, it is possible to confirm this pest is *Anselmella malacia* Xiao & Huang rather than *Anselmella miltoni* Girault (table 2).

Table 2. Comparative characters of *Anselmella malacia* Xiao & Hoang, 2006

Characters	<i>Anselmella malacia</i> (Original description)	<i>Anselmella malacia</i> (from Dong Thap, Vietnam, n = 30)
Eye height : Malar space	2.6 ×	2.80 ± 0.18
Head width : Head height (frontal view)	1.3 ×	1.30 ± 0.04
Head width : Head length (dorsal view)	1.95 ×	2.04 ± 0.15
Head width : Mouth width	2.4 ×	2.40 ± 0.09
Eye height : Eye length	1.2 ×	1.18 ± 0.06
POL : OOL	2.9 ×	2.70 ± 0.32
Eye length : Temple (dorsal view)	20.0 ×	19.55 ± 1.06
Scapus length : maximum width	1.9 ×	1.87 ± 0.23
MV : PMV	2.3 ×	2.18 ± 0.31
PMV : STV	0.2 ×	0.25 ± 0.03
Metasoma length : width	1.5 ×	1.50 ± 0.18
Body length (female)	2.2 mm	2.54 ± 0.16 mm
Body length (male)	1.5–2.0 mm	1.74 ± 0.38 mm

Notes: MV = Marginal vein; PMV = Postmarginal vein; SMV = Submarginal vein; STV = Stigmal vein.

**Preliminary biological characteristics of *A. Malacia***

Emerged adults were separated into males and females, and pairs of males and females were observed separately. While sucking flower nectar, *A. malacia* females prefer

laying their eggs inside the most soft tissue of flower style during the anthesis stage of fruit phenology of *S. samarangense* (Fig. 3A), where eggs were laid as the clusters (Fig. 3B) or masses (Fig. 3C) and were white or creamy white, oval in shape (Figs. 3B–3C).

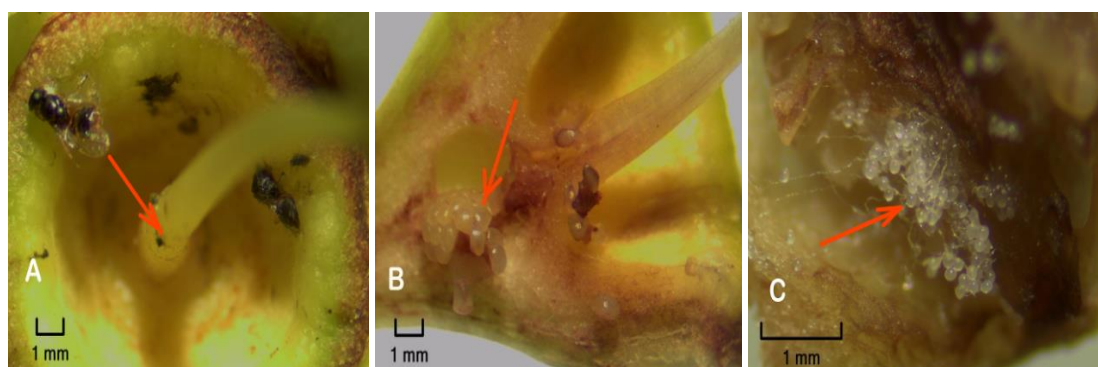


Figure 3. A = Hole made by *A. malacia* female on flower style; B and C = Clusters/masses of eggs inside of flower ovaries

The egg stage of *A. malacia* overlaps with the petal fall stage in *S. samarangense*.

Immature stage of *A. malacia* develops through a rapid stage to the middle fruit stage.

*Anselmella malacia* enters into pupal stage and adults emerge, when the fruits of *S. samarangense* are in the mature stage.

After hatched from eggs inside the fruitlets, larvae feed on the internal tissues of water apple fruits, larval and pupal stages lasts inside the fruits. Adults are emerged inside of the fruit cavity, where several holes are left (Figs. 4 A & B).

In this study, another hymenopteran wasp, *Megastigmus* sp. (Hymenoptera;

Chalcidoidea: Torymidae), was found in the cavity of water apple fruits in Cao Lanh, Dong Thap (Fig. 5). In some published literatures (Roques et al., 1995; Roques et al., 2016), this wasp species was recorded and reported as a seed-feeding that emerged from seeds of wild rose, *Rosa canina*, in Ukraine. According to Doganlar & Hassan (2010), Australian species of *Megastigmus* were recorded as pests associated with *Eucalyptus* plants.

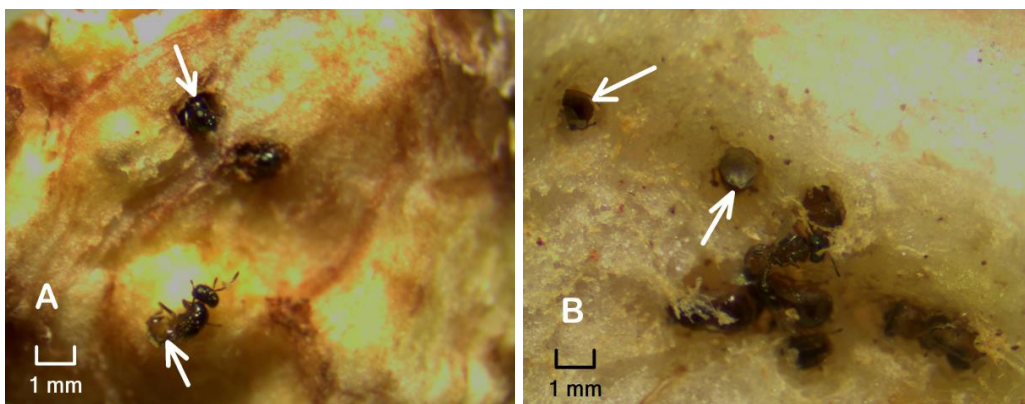


Figure 4. A & B = Holes after *A. malacia* adults emerged outside of the fruit cavity

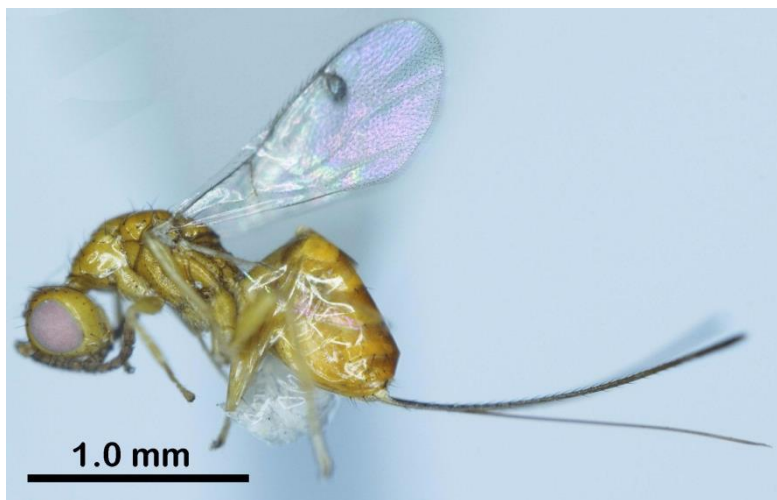


Figure 5. *Megastigmus* sp. (Habitus, female)

#### Hymenopteran parasitoid associated with the fruit infested insect pests

One dominant parasitic wasp, *Aprostocetus* sp. (Hymenoptera:

Chalcidoidea: Eulophidae) (Fig. 6), was surveyed and collected from water apple fruits in Cao Lanh City, Dong Thap Province, in March 2019, and this parasitoid is probably an

egg parasitoid of *A. malacia* because the parasitic wasp was not directly reared from *Anselmella malacia* but parasitoid was incidentally captured inside of water apple fruits when the fruits were collected. However, two species of the genus

*Aprostocetus*, *A. causalis* La Salle & Wu, from China and Thailand and *A. felix* La Salle, Yang & Lin, from Taiwan, were reported as fortuitous parasitoids of invasive eulophid gall inducers (Tetrastichinae) on *Eucalyptus* and *Erythrina* (Yang et al., 2014).

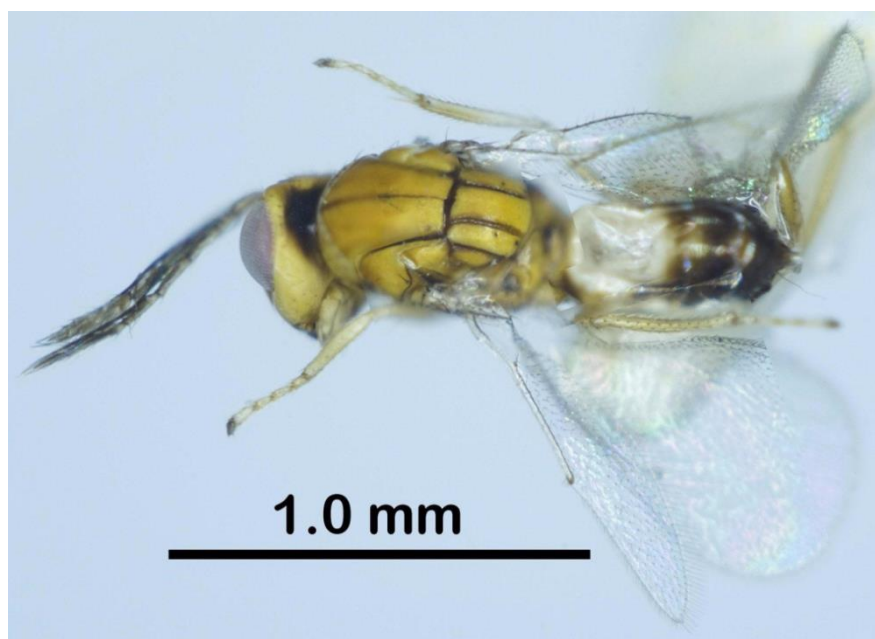


Figure 6. *Aprostocetus* sp. (Habitus, male)

## DISCUSSION

Based on the comparative morphological characters of the eulophids collected from fruits of *Syzygium samarangense* in Cao Lanh city, Dong Thap, *Anselmella malacia* was revealed as one of few gall-inducing hymenopteran wasps living inside of fruits and this pest was recorded for the first time in Vietnam. Inducing galls within the seed chamber of the fruits of the water apple fruits, *A. malacia* has emerged as a serious problem for all the varieties of the cultivated *S. samarangense* in Cao Lanh City, Dong Thap Province.

Contrary to the frugivorous insect, *Bactrocera dorsalis* (Diptera: Tephritidae), which induces either an immature fruit drop or decay in pulp in the cultivated water apple, *A. malacia* should be considered as an issue of deep concern for the horticultural industry not

only in Dong Thap Province, but all over Vietnam. Since there is not any practice applied for the control of *A. malacia* up to know, control measures should be introduced in the studied area as soon as possible.

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