



# Training on Rice Arthropod Biodiversity and Taxonomy



**IRRI**



Sept 12-16, 2011  
Pathumthani Rice  
Research Center,  
Pathumthani, Thailand

# Technical Report

## FOURTH TAXONOMY SHUTTLE COURSE ON RICE ARTHROPOD BIODIVERSITY (Thailand: September 12-16, 2011)

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### EXECUTIVE SUMMARY

The fourth taxonomy shuttle training course on arthropod biodiversity conducted for ecological engineering research staff and enthusiasts was held in Pathumthani Rice Research Institute, Pathumthani Province, Thailand on September 12-16, 2011. Twenty-six participants – 24 from the rice research center and 2 from the rice seed center representing a mixture of agronomists, entomologists and plant pathologists joined the training course. The trainees were taught hands-on techniques on arthropod processing for preservation and identification based on the rice fauna from Thailand that represented 6,487 specimens belonging to 11 orders (10 insects and 1 spider) constituting 97 families (86 insects and 11 spiders). Overall the training course was successful with a knowledge gain ranging from 6-60% based on pre-and post evaluation.

Ecological engineering- one of the leading projects of the International Rice Research Institute (IRRI), Philippines is gaining momentum among the rice growing tracts that currently re- experienced the “tsunami-like invasion of the Green Revolution pest” known as the rice brown planthopper, *Nilaparvata lugens* (Stal) and its relatives, *Sogatella* spp. and *Laodelphax striatellus* (Fallen) in South and Southeast Asia particularly in China, Malaysia, Thailand and Vietnam. Myanmar and the Philippines are also sharing similar interest in conducting the project. It aims to restore floral and faunal diversity in- and around rice fields—two important components in the rice habitat lost if not endangered by unnecessary use of chemical pesticides. The latter component is the key factor needed to promote the ecological functions or natural control by predators and parasitoids in regulating pest populations. Adoption of ecological engineering on a wide scale will restore and conserve arthropod biodiversity in the rice agroecosystems.

Underpinning the research project, however, is the lack of “cadre of taxonomists” who can identify the diversity of predators, parasites and parasitoid species present in a given rice ecosystem. It is imperative to run basic arthropod identification training shuttle courses because of its paramount importance in ecological research endeavors, if one is to understand the intricate components and interactions, which are vital in developing better pest management tools and strategies. In realization to cope, three series of taxonomy shuttle courses had been conducted at CESD, IRRI (1<sup>st</sup>, March 1-12, 2010); Hainan Island, China (2<sup>nd</sup>, August 9-13, 2010) and Myanmar (3<sup>rd</sup>, July 11-22, 2011). A cadre of 56 trainees had been trained in arthropod (insects and spiders) taxonomy.

The 4<sup>th</sup> one-week training course on Rice Arthropod Biodiversity and Taxonomy (RABIT) was conducted on Sept. 12-16, 2011 at the Pathumthani Rice Research Center (PRRC), Pathumthani, Thailand. Twenty-six participants-24 from the rice research center and 2 from the rice seed center all from the Rice Department of Thailand attended the course (Table 1). The trainees represented a mixed group of agronomists, entomologists and plant pathologists.

The course was handled by a team from IRRI-CESD led by Dr. Alberto T. Barrion, Entomology Consultant in arthropod taxonomy and assisted by Miss Josie Lynn A. Catindig, Assistant Scientist and Miss Sylvia S. Villareal, Research Assistant. The participants were trained in the identification of 86 families of insects belonging to 10 orders (Class Insecta), namely, Odonata (damselfly and dragonflies); Orthoptera (grasshoppers, locusts, field and mole crickets & meadow grasshoppers); Dermaptera (earwigs); Thysanoptera (thrips); Hemiptera (aphids, bugs, leaf and planthoppers); Coleoptera (beetles); Strepsiptera (twisted-winged insects); Lepidoptera (moths and butterflies); Diptera (flies) and Hymenoptera (ants and wasps); and 11 families of spiders—Araneidae, Lycosidae, Linyphiidae, Oxyopidae, Clubionidae, Salticidae, Tetragnathidae, Thomisidae, Theridiidae, Heteropodidae and Gnaphosidae under Order Araneae (Class Arachnida). The training course taught the trainees hands-on processing of the arthropod collection prior to identification such as wet and dry preservation, card-pointing, slide mounting, spreading on boards, and labeling.

Benchmark and post evaluations were administered to the participants to evaluate their performance.

Mr. Paitoon Urairong, Director of the Bureau of Rice Research and Development (BRRD) assisted by Dr. Luechai Arayarungsarit, Assistant Director and Mrs. Dali Chillnachit, Agricultural Advisor to the Director General opened the training course. He welcomed all the participants, observers, and the trainers and extended his thanks to Dr. KL Heong and the IRRI Team for the offering of the special taxonomy training in his center. He emphasized its importance for the future of rice agriculture in Thailand and the need to mold young Thai scientists in the field of taxonomy. Accordingly, most of the Thai scientists dealing with taxonomy had retired with no successors.

Mr. Surapol Chatuporn, Director of the Pathumthani Rice Research Institute graced the closing ceremony. He thanked the IRRI team for a job well done and is hopeful for fruitful results among the participants when they go back to their respective institutions. He reiterated that all participants have to practice and apply the knowledge gained from the training in identifying insects and spiders collected or still to be collected from rice fields in Thailand.

Table 1. List of Thai participants in the arthropod taxonomy training course in Pathumthani, Thailand conducted on September 12-16, 2011.

Name	Institute
Sujitra Suesat	Nakhonsawan Rice Seed Center
Wannaphan Janlapha	Prachinburi Rice Research Center

Supattana Bureerat	Chumphae Rice Research Center
Wiphawadee Chamnam	Lpoburi Rice Research Center
Sumalee Jitkhum	Nakhon Ratchasima Rice Research Center
Noppadol Somna	Phrae Rice Research Center
Wannisa Tananta	Chiangmai Rice Research Center
Paenphang Jinachai	Klonglaung Rice Research Center
Kiattisak Kerdsuk	Phisanulok Rice Seed Center
Petcharee Sengsim	Phatthalung Rice Research Center
Chonnipa Nuanthong	Nongkhai Rice Research Center
Suphattrahra Phansuk	Ayutthaya Rice Research Center
Kanuengnij Srivilai	Bureau of Rice Research and Development
Phamorn Pattawatang	Phisanulok Rice Seed Center
Royboon Jumruskaru	Nakhon Si Thammarat Rice Research Center
Chalermkwan Chimwai	Pathumthani Rice Research Center
Chalernpol Chalernpolyotin	Pathumthani Rice Research Center
Kanokon Dokmaithas	Suphanburi Rice Research Center
Chainarong Tammirattanakasame	Bureau of Rice Research and Development
Nootjarin Jungkhun	Chiangri Rice Research Center
Prachack Lengbumrung	Ratchaburi Rice Research Center
Kunlayaa Boonsanga	Sakon Nakhon Rice Research Center
Rungruung Deelee	Bureau of Rice Research and Development
Phathra Pholsreda	Nakhon Ratchasima Rice Research Center
Sittichai Phootong	Phisanulok Rice Research Center
Xittiphong Phengrat	Khon Khan Rice Research Center

The trainees were grouped into 13 groups and allowed to sort and identify their arthropod collection based on order. Table 2 shows a total of 6,490 arthropod collections identified to the order category. Groups 1, 4, 5, 2 and 6 performed better sorting and order level identification of arthropods than the other groups.

Table 2. Total arthropods sorted by the 13 groups Thai trainees based on order.

Group no.	Members	Sorted materials	Total (no.)
1	Prachak, Kornsiri and Nootjarin	Araneae	313
		Coleoptera	19
		Diptera	243
		Hemiptera	347
		Lepidoptera	5
		Odonata	22
		Orthoptera	4
		Thysanoptera	1
		<b>954</b>	
2	Paenphang and Sujitra	Araneae	94
		Coleoptera	15
		Diptera	320

		Hemiptera Hymenoptera Lepidoptera Odonata Orthoptera Thysanoptera	111 21 1 25 1 1	<b>589</b>
3	Petcharee and Royboon	Araneae Coleoptera Diptera Hemiptera Hymenoptera Lepidoptera Odonata	110 34 50 110 29 4 40	<b>387</b>
4	Kunlayaa and Wannisa	Araneae Coleoptera Diptera Ephemeroptera Hemiptera Hymenoptera Lepidoptera Odonata Orthoptera Thysanoptera	238 50 123 1 324 93 11 56 10 5	<b>911</b>
5	Wiphawadee, Supattana and Chonnipa	Araneae Coleoptera Diptera Hemiptera Hymenoptera Lepidoptera Odonata Orthoptera	161 13 333 180 36 4 27 2	<b>756</b>
6	Rungruung and Noppadol	Araneae Coleoptera Diptera Ephemeroptera Hemiptera Hymenoptera Lepidoptera Odonata Orthoptera Thysanoptera	103 31 175 130 60 3 18 5 3	<b>528</b>

7	Phamorn, Sittichai and Kiattisak	Araneae Coleoptera Diptera Hemiptera Hymenoptera Odonata Thysanoptera	70 25 167 82 45 19 2 <b>410</b>
8	Phathra and Sumalee	Araneae Coleoptera Diptera Hemiptera Hymenoptera Lepidoptera Odonata Orthoptera	147 25 158 58 11 3 15 1 <b>418</b>
9	Suphatthra and Poramapoon	Araneae Coleoptera Diptera Hemiptera Hymenoptera Odonata Orthoptera	100 10 25 100 10 28 1 <b>274</b>
10	Kittipong and Chalermkwan	Araneae Coleoptera Diptera Hemiptera Hymenoptera Lepidoptera Odonata Orthoptera	20 38 30 77 15 38 1 4 <b>223</b>
11	Chalernpol and Kanokon	Araneae Coleoptera Diptera Ephemeroptera Hemiptera Hymenoptera Lepidoptera Odonata Orthoptera Thysanoptera	355 10 10 24 3 1 6 1 2 <b>412</b>
12	Kanuengnij and	Araneae	223

	Chainarong	Coleoptera Diptera Hemiptera Hymenoptera Odonata Thysanoptera	16 28 163 19 10 8	<b>467</b>
13	Wannaphan and Thasdaw	Araneae Coleoptera Diptera Hemiptera Hymenoptera Odonata Orthoptera Thysanoptera	84 9 26 22 2 15 2 1	<b>161</b>

The same group was allowed to identify the collections down to species level. A total of 1,763 specimens were identified to either generic or species level. The group of entomologists in groups 4, 5 and 6 identified most of the specimens to the species level recording 28, 25 and 23 species identified respectively (Table 3).

Table 3. Species level identification rendered by the trainees.

Group no.	Order	Family	Species	Total (no.)
1	Coleoptera	Coccinellidae	<i>Micraspis discolor</i>	8
		Curculionidae	<i>Bagous</i> sp.	1
		Chrysomelidae		2
	Diptera	Empididae	<i>Drapetis (Drapetis)</i> sp.	98
	Hymenoptera	Braconidae	<i>Aulacocentrum philippinensis</i>	1
Odonata	Coenagrionidae	<i>Agriocnemis</i> sp.	20	
Thysanoptera	Thripidae		1	
				<b>131</b>
2	Araneae	Tetragnathidae	<i>Tetragnatha</i> sp.	3
	Coleoptera	Carabidae	<i>Ophionea nigrofasciata</i>	1
			<i>Ophionea indica</i>	1
		Chrysomelidae	<i>Dicladispa armigera</i>	1
Coccinellidae	<i>Micraspis</i> sp.	1		

		Curculionidae	<i>Sitophilus oryzae</i>	1
		Hydrophilidae	<i>Sternolophus</i> sp.	1
			<i>Berosus</i> sp.	1
		Scarabaeidae	<i>Leucopholis irrorata</i>	1
	Diptera	Sciomyzidae	<i>Sepedon</i> sp.	11
		Pipunculidae	<i>Pipunculus</i> sp.	6
		Chironomidae	<i>Chironomus</i> sp.	6
	Hemiptera (Suborder Homoptera)	Cicadellidae	<i>Nephotettix virescens</i>	5
			<i>Recilia dorsalis</i>	38
		Delphacidae	<i>Nilaparvata lugens</i>	5
			<i>Sogatella</i>	1
			<i>longifurcifera</i>	
			<i>Sogatella</i> sp.	1
		Aphididae	<i>Tetraneura</i> sp.	1
	Hemiptera (Suborder Heteroptera)	Miridae	<i>Cyrtorhinus</i> sp.	5
	Hymenoptera	Ceraphronidae	<i>Ceraphron</i> sp.	1
		Mymaridae	<i>Anagrus</i> sp.	2
	Odonata	Coenagrionidae	<i>Agriocnemis</i> sp. 1	8
			<i>Agriocnemis</i> sp. 2	4
			<i>Agriocnemis</i> sp. 3	3
			<i>Agriocnemis</i> sp. 4	2
	Orthoptera	Tettigoniidae	<i>Conocephalus longipennis</i>	1
				<b>72</b>
3	Coleoptera	Coccinellidae	<i>Micraspis crocea</i>	3
			<i>Micraspis discolor</i>	4
		Chrysomelidae	<i>Lema</i> sp.	1
		Hydrophilidae	<i>Sternolophus rufipes</i>	1
	Diptera	Sciomyzidae	<i>Sepedon</i> sp.	5
		Ephydriidae	<i>Ochthera sauteri</i>	1
			<i>Notiphila</i> sp.	4
		Empididae	<i>Drapetis</i> sp.	8
		Chloropidae	<i>Anatrichus pygmaeus</i>	2
	Hemiptera (Suborder Homoptera)	Cicadellidae	<i>Recilia dorsalis</i>	20
			<i>Nephotettix nigropictus</i>	5

	Lepidoptera	Pyralidae		3
	Odonata	Coenagrionidae	<i>Agriocnemis femina</i> <i>femina</i>	1
			<i>Agriocnemis</i> sp.	27
			<i>Aciagrion</i>	8
				<b>93</b>
4	Araneae	Tetragnathidae	<i>Tetragnatha</i> sp.	17
		Araneidae	<i>Araneus</i> sp.	11
	Coleoptera	Coccinellidae	<i>Micraspis discolor</i>	13
		Chrysomelidae	<i>Dicladispa armigera</i>	1
		Anthicidae	<i>Anthicus</i> sp.	1
		Carabidae	<i>Ophionea</i> <i>nigrofasciata</i>	1
		Staphylinidae	<i>Paederus fuscipes</i>	1
		Hydrophilidae	<i>Berosus</i> sp.	2
	Ephemeroptera			1
	Hemiptera	Reduviidae	<i>Polytoxus</i> sp.	1
		Delphacidae	<i>Sogatella furcifera</i> <i>Nilaparvata lugens</i>	14
				20
		Cicadellidae	<i>Recilia dorsalis</i> <i>Nephotettix virescens</i>	62
			<i>N. nigropictus</i>	13
				1
		Miridae	<i>Cyrtorhinus</i> <i>lividipennis</i>	4
		Saldidae	<i>Saldula ornatula</i>	1
		Lygaeidae	<i>Cymoninus turaensis</i>	1
		Aphididae		1
	Hymenoptera	Bethylidae	<i>Goniozus</i>	1
		Braconidae	<i>Opius barrioni</i>	13
		Ichneumonidae	<i>Temelucha</i>	1
	Lepidoptera	Pyralidae	<i>Cnaphalocrocis</i> <i>medinalis</i>	6
	Odonata	Coenagrionidae	<i>Agriocnemis femina</i> <i>femina</i>	48
			<i>A. pygmaea</i>	4
	Orthoptera	Tettigoniidae	<i>Conocephalus</i>	6

		Gryllidae	<i>longipennis</i> <i>Anaxipha longipennis</i>	4
			<i>Metioche vittaticollis</i>	2
		Acrididae	<i>Oxya sp.</i>	1
				<b>252</b>
5	Araneae	Tetragnathidae	<i>Tetragnatha sp.</i>	8
	Coleoptera	Staphylinidae	<i>Paederus fuscipes</i>	2
		Coccinellidae	<i>Micraspis sp.</i>	2
	Diptera	Sciomyzidae	<i>Sepedon sp.</i>	1
		Chloropidae	<i>Anatrichus pygmaeus</i>	6
		Ephydriidae	<i>Hydrellia sp.</i>	1
			<i>Scatella stagnalis</i>	2
	Hemiptera	Cicadellidae	<i>Nephotettix virescens</i>	13
			<i>Recilia dorsalis</i>	14
		Delphacidae	<i>Nilaparvata lugens</i>	3
		Derbidae		5
		Aphididae		1
		Miridae	<i>Cyrtorhinus sp.</i>	6
	Hymenoptera	Braconidae	<i>Opius barrioni</i>	3
			<i>Aulacocentrum philippinensis</i>	2
		Eulophidae	<i>Pediobius</i>	2
		Mymaridae	<i>Anagrus.</i>	5
		Pteromalidae	<i>Trichomalopsis</i>	1
		Eupelmidae	<i>Eupelmus</i>	1
	Lepidoptera	Pyralidae	<i>Cnaphalocrocis medinalis</i>	3
	Odonata	Libellulidae	<i>Diplacodes trivialis</i>	1
		Coenagrionidae	<i>Agriocnemis femina femina</i>	1
			<i>A. pygmaea</i>	27
	Orthoptera	Gryllidae	<i>Anaxipha longipennis</i>	1
			<i>Metioche vittaticollis</i>	1
				<b>112</b>
6	Coleoptera	Coccinellidae	<i>Micraspis discolor</i>	20
		Staphylinidae	<i>Paederus fuecipes</i>	6
			Unknown	1
	Hemiptera	Cicadellidae	<i>Recilia dorsalis</i>	60

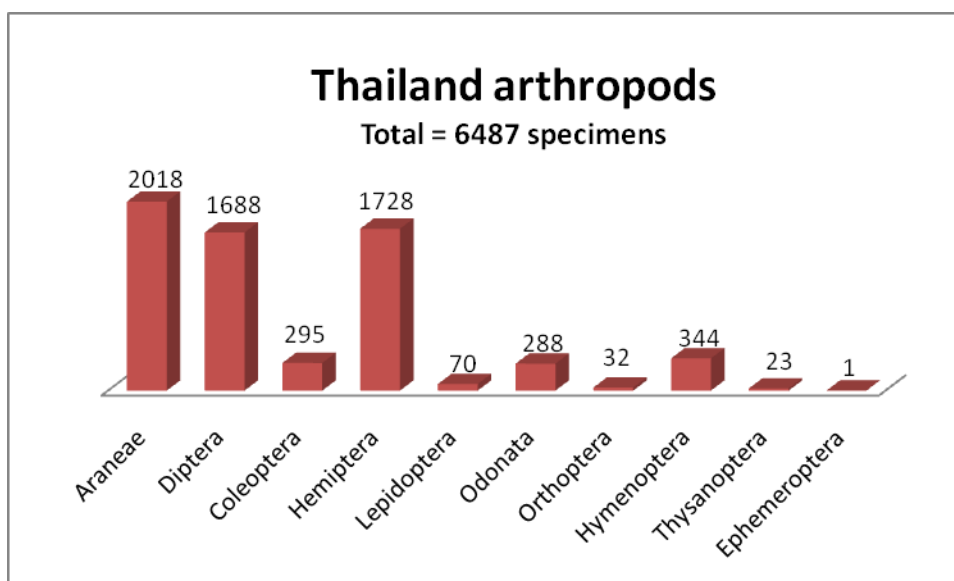
			<i>Nephotettix</i>	20
			Unknown	4
		Miridae	<i>Cyrtorhinus</i>	6
			<i>lividipennis</i>	
		Delphacidae		22
	Hymenoptera	Trichogrammatidae	<i>Oligosita</i>	17
		Mymaridae	<i>Gonatocerus</i>	25
			<i>Anagrus</i>	1
			<i>Mymar taprobanicum</i>	61
		Ceraphronidae		4
		Dryinidae	<i>Gonatopus</i>	1
		Braconidae	<i>Cotesia</i>	10
			<i>Opius</i>	8
			Unknown	1
		Pteromalidae	<i>Trichomalopsis</i>	4
		Eulophidae	<i>Stenomesus japonicus</i>	1
			<i>Euplectrus</i>	1
			<i>Tetrastichus</i>	3
		Eurytomidae	<i>Eurytoma</i>	1
		Unknown		5
	Odonata	Coenagrionidae		18
				<b>300</b>
7	Areaneae	Tetragnathidae	<i>Tetragnatha</i> sp.	14
		Araneidae	<i>Araneus</i> sp.	20
		Linyphiidae	<i>Erigone</i> sp.	17
		Lycosidae	<i>Pardosa</i> sp.	4
	Coleoptera	Staphylinidae		7
		Coccinellidae		2
		Chrysomelidae		1
	Hemiptera	Delphacidae	<i>N. lugens</i>	7
			<i>S. furcifera</i>	1
			<i>Tagosodes pusanus</i>	4
			<i>S. vibix</i>	2
		Meenoplidae		1
		Cicadellidae	<i>Recilia dorsalis</i>	35
			<i>Nephotettix</i>	19
		Miridae	<i>Cyrtorhinus</i>	8
			<i>Halticus</i>	1
			Others	4
	Lepidoptera	Pyralidae	<i>Marasmia patnalis</i>	1

	Odonata	Coenagrionidae	<i>Agriocnemis femina</i> <i>Agriocnemis pygmaea</i>	2 15
	Orthoptera	Gryllidae	<i>Anaxipha longipennis</i> <i>Euscyrus concinuus</i>	1 1
	Thysanoptera	Thripidae		1 <b>168</b>
8	Blattodea	Blattellidae		1
	Coleoptera	Chrysomelidae	<i>Di cladispa armigera</i>	1
		Carabidae	<i>Ophionea hoashi</i> <i>hoashi</i>	1
		Staphylinidae	<i>Paederus fuscipes</i>	2
		Coccinellidae	<i>Micraspis discolor</i>	7
	Diptera	Ephydriidae	<i>Ochthera sauteri</i>	2
		Sciomyzidae		5
	Hymenoptera	Braconidae	<i>Opius</i>	7
	Odonata	Coenagrionidae	<i>A. pygmaea</i>	15 <b>41</b>
9	Araneae	Tetragnathidae	<i>Tetragnatha</i>	1
		Araneidae	<i>Araneus</i>	1
	Coleoptera	Coccinellidae	<i>Micraspis</i>	5
		Curculionidae	<i>Bagous</i>	1
	Diptera			
	Hemiptera (Suborder Homoptera)	Cicadellidae	<i>Recilia dorsalis</i> <i>Nephotettix virescens</i>	37 10
		Delphacidae	<i>Nilaparvata lugens</i> <i>Sogatella furcifera</i>	10 1
	Hymenoptera	Braconidae		
		Ichneumonidae		
		Scelionidae		
	Odonata	Coenagrionidae	<i>Agriocnemis</i>	27
		Libellulidae	<i>Diplacodes</i>	1 <b>94</b>
10	Araneae	Tetragnathidae	<i>Tetragnatha</i>	1
		Araneidae	<i>Araneus</i>	1

		Dysderidae		1
		Linyphiidae		1
	Coleoptera	Coccinellidae	<i>Micraspis</i>	12
		Staphylinidae	<i>Paederus fuscipes</i>	12
		Carabidae	<i>Ophionea nigrofasciata</i>	2
	Diptera	Sciomyzidae		17
	Hemiptera	Cicadellidae	<i>Nephotettix virescens</i>	44
			<i>Recilia dorsalis</i>	9
		Delphacidae	<i>Nilaparvata lugens</i>	9
			<i>Sogatella furcifera</i>	4
		Miridae	<i>Cyrtorhinus lividipennis</i>	6
	Odonata	Coenagrionidae	<i>Agriocnemis femina femina</i>	35
				<b>159</b>
11	Araneae	Tetragnathidae	<i>Tetragnatha</i>	21
		Lycosidae	<i>Pardosa</i>	1
		Linyphiidae	<i>Atypena</i>	1
			<i>Erigone</i>	5
	Coleoptera	Staphylinidae	<i>Paederus fuscipes</i>	8
		Coccinellidae	<i>Micraspis</i>	1
	Diptera	Ephydriidae	<i>Ochthera sauteri</i>	1
	Hemiptera (Suborder Heteroptera)	Miridae	<i>Cyrtorhinus</i>	3
		Mesoveliidae	<i>Mesovelia</i>	6
	Hemiptera (Suborder Homoptera)	Delphacidae	<i>Nilaparvata lugens</i>	3
			<i>Sogatella furcifera</i>	4
		Cicadellidae	<i>Nephotettix nigropictus</i>	10
			<i>Nephotettix virescens</i>	6
			<i>Recilia dorsalis</i>	7
			<i>Cofana spectra</i>	9
	Lepidoptera	Pyralidae	<i>Marasmia patnalis</i>	1
	Odonata	Coenagrionidae	<i>Agriocnemis femina femina</i>	6
				<b>93</b>
12	Coleoptera	Coccinellidae	<i>Micraspis</i>	2
		Staphylinidae	<i>Paederus fuscipes</i>	11

	Diptera	Sciomyzidae Empididae Tachinidae Ephydriidae Chloropidae		5 8 1 9
	Hemiptera (Suborder Homoptera)	Cicadellidae Delphacidae	<i>Recilia</i>	59 33
	Hemiptera (Suborder Heteroptera)	Alydidae		1
	Hymenoptera	Braconidae Eulophidae Ceraphronidae		14 5 1
	Lepidoptera	Pyralidae		6
	Odonata	Coenagrionidae	<i>Agriocnemis</i>	
	Thysanoptera	Thripidae		7
				<b>162</b>
13	Hemiptera	Miridae Cicadellidae  Delphacidae	<i>Cyrtorhinus</i> sp. <i>Nephotettix virescens</i> <i>Nephotettix nigropictus</i> <i>Recilia dorsalis</i> <i>Nilaparvata lugens</i> <i>Sogatella furcifera</i>	13 6 2 37 4 7
	Odonata	Coenagrionidae	<i>Agriocnemis pygmaea</i>	15
	Orthoptera	Gryllidae	<i>Anaxipha longipennis</i>	2
				<b>86</b>

Figure 1 shows the 6,487 individuals of arthropods collected from Thailand rice fields identified by the trainees down to the species level and correctly associated with the proper orders and families. This figure shows the efficiency of some Thais in identification after the training course.



**Figure 1.** The identification output of the trainees after their training.

### Pre- and post evaluation of participant's performance in the arthropod taxonomy course.

The result of pre- and post evaluation of participants is shown in Table 4. As surmised, the pre-evaluations were low ranging from 4-66% but take off in the end with 17-85%. Knowledge gain posted a reasonable achievement of 6-60% (Table 4)

Table 4. Comparison of the pre-and post evaluation of participants.

Name	Pre	Percent (%)	Post	Percent (%)	Percent (%) increment
Sujitra Suesat	17	20	43	80	60
Wannaphan Janlapha	4	8	34	63	55
Supattana Bureerat	12	20	32	59	39
Wiphawadee Chamnam	14	28	36	67	39
Sumalee Jitkhum	7	14	28	52	38
Noppadol Somna	5	10	24	44	34
Wannisa Tananta	10	20	29	53	33
Paenphang Jinachai	9	18	27	50	32
Kiattisak Kerdsuk	19	38	38	70	32
Petcharee Sengsim	21	42	40	74	32
Chonnipa Nuanthong	9	18	26	48	30

Suphattrahra Phansuk	10	20	27	50	30
Kanuengnij Srivilai	14	28	31	57	29
Phamorn Pattawatang	5	10	21	39	29
Royboon Jumruskaru	22	44	39	72	28
Chalermkwan Chimwai	24	48	40	74	26
Chalermpol Chalermpolyotin	7	14	21	39	25
Kanokon Dokmaithas	12	24	26	48	24
Chainarong Tammirattanakasame	15	30	29	53	23
Nootjarin Jungkhun	9	18	21	39	21
Prachack Lengbumrung	23	46	36	67	21
Kunlayaa Boonsanga	33	66	46	85	19
Rungruung Deelee	32	64	43	80	16
Phathra Pholsreda	12	24	21	39	15
Sittichai Phootong	2	4	9	17	13
Xittiphong Phengrat	32	64	38	70	6

In general, the Thai trainees considered the taxonomy training course very good for them. To some, however, the course requires a longer time allocation.

Table 5. Workshop evaluation by participants.

<b>Questions:</b>	<b>Criteria/Comments</b>	<b>Rating (%)</b>
The workshop as a whole was:	Excellent Very good Acceptable Needs improvement No answer	35 65 0 0 0
The workshop objectives were:	Excellent Very good Acceptable Needs improvement	35 65 0 0
The workshop content was	Excellent Very good Acceptable Needs improvement	23 77 0 0
Workshop organization was	Excellent Very good Acceptable Needs improvement	31 65 4 0
The materials such as	Excellent	42

handouts, insect samples, and other visual aids used in the workshop were:	Very good Acceptable Needs improvement	58 0 0
The duration of the course was:	Excellent Very good Acceptable Needs improvement	8 46 8 10
I understood the lectures and other things being pointed out during the workshop.	Excellent Very good Acceptable Needs improvement	16 46 38 0
I am now ready to work on my arthropod samples after this workshop.	Excellent Very good Acceptable Needs improvement No answer	4 65 31  
The resource person's contribution to the workshop was:	Excellent Very good Acceptable Needs improvement	35 65 0 0
The resource person's effectiveness in teaching the subject matter was:	Excellent Very good Acceptable Needs improvement	58 38 4 0
The clarity of resource person's voice was:	Excellent Very good Acceptable Needs improvement	27 54 19 0
What do you like best in this workshop?	Identification Dr. Barrion's teaching method Dr. Barrion and his team Materials for the workshop Good microscope Learned more No answer	23 31 4 11 4 4 23
What do you like least in this workshop?	Limited time No answer Limited time and lecture very difficult to understand Does not understand the words Identification of orders and families Advisors and their staff None	46 35 7 4 4 4 4

Any specific comments or recommendations about the workshop?	Longer workshop	42
	No answer	34
	Hope to learn again	4
	Narrator of Thai language	4
	Longer workshop and narrator of Thai language	4
	Very small white board	4
	Less time to learn and to remember the identification	4
	None but excellent	4



Figure 2. Participants in the 4<sup>th</sup> arthropod biodiversity training course held at Pathumthani Rice Research Institute, Pathumthani, Thailand on September 12-16, 2011.