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**THE ENTOMOLOGICAL EXPEDITIONS IN NORTHERN VIETNAM ORGANIZED BY
THE VIETNAM NATIONAL MUSEUM OF NATURE, HANOI AND
THE NATURAL HISTORY MUSEUM OF THE UNIVERSITY OF FLORENCE (ITALY)
DURING THE PERIOD 2010-2013**

Abstract. The four entomological expeditions in Vietnam organized by the Natural History Museum of the University of Florence and the Vietnam National Museum of Nature during the period 2010-2013 are illustrated. The full list of collected material is given. Remarks on Coleoptera Lucanidae and Brentidae, Hemiptera Gerromorpha, Nepomorpha and Leptopodomorpha, *Rhynchophorus ferrugineus* (Coleoptera: Curculionoidea: Dryophthoridae), Lepidoptera and photo techniques are also given.

Tóm tắt. Trong thời gian từ 2010 đến 2013, Bảo tàng Thiên nhiên Việt Nam và Bảo tàng Lịch sử Tự nhiên thuộc Đại học Florence đã tổ chức bốn chuyến khảo sát côn trùng tại Việt Nam. Mẫu vật của một số nhóm côn trùng được thu thập để nghiên cứu. Một số nhận xét về bộ cánh cứng Coleoptera (họ Lucanidae và Brentidae), bộ cánh nửa Hemiptera (phân bộ Gerromorpha, Nepomorpha và Leptopodomorpha), loài đuông dừa *Rhynchophorus ferrugineus* (Coleoptera: Curculionoidea: Dryophthoridae), bướm và ngài (Lepidoptera) và kỹ thuật chụp ảnh được trình bày trong bài báo.

Riassunto. Vengono illustrate le quattro spedizioni entomologiche in Vietnam organizzate nel periodo 2010-2013 dal Museo di Storia Naturale dell'Università degli Studi di Firenze in collaborazione con il Vietnam National Museum of Nature di Hanoi. Viene fornita una lista completa del materiale raccolto durante le missioni. Vengono inoltre esaminate in maggior dettaglio le raccolte relative ai seguenti taxa: Coleoptera Lucanidae e Brentidae, Hemiptera Gerromorpha, Nepomorpha e Leptopodomorpha, *Rhynchophorus ferrugineus* (Coleoptera: Curculionoidea: Dryophthoridae), Lepidoptera. Vengono fornite anche indicazioni sulle tecniche fotografiche utilizzate.

Key words. Vietnam, insects, faunistic, protected areas, Lucanidae, Brentidae, Gerromorpha, Nepomorpha, Leptopodomorpha, *Rhynchophorus ferrugineus*.

Introduction

In the year 2010 a Memorandum of Understanding was signed between the Vietnam National Museum of Nature, Hanoi (Socialist Republic of Vietnam) and the Natural History Museum of the University of Florence (Italy). This MoU lasted 3 years and a new version was signed at the beginning of 2013 for the next three years, thus due to expire in 2015. The aim of these MoUs was to promote cooperation in scientific research between the two Institutions, mainly in the fields of entomology and biodiversity. Vietnam is one of the world's hotspots in term of biodiversity and its insect fauna is still far from being well known. In the framework of these MoUs four entomological expeditions were organized during the years 2010-2013 (see Tab. 1). All the collecting localities were located in the Northern part of Vietnam (Fig. 1).

<i>date</i>	<i>members of the expedition</i>	<i>collecting localities</i>
4-23.VI.2010	Vu Van Lien, Luca Bartolozzi, Saulo Bambi, Lorenzo Benini	Tam Dao National Park, Xuan Son National Park
20.V-12.VI.2011	Vu Van Lien, Luca Bartolozzi, Eylon Orbach, Saulo Bambi, Filippo Fabiano	Van Ban Nature Reserve, Hoang Lien National Park, Ba Be National Park
11-27.VI.2012	Vu Van Lien, Luca Bartolozzi, Eylon Orbach, Saulo Bambi, Filippo Fabiano	Phia Oac Nature Reserve, Tam Dao National Park, Xuan Son National Park, Ba Vi National Park
31.V-16.VI.2013	Vu Van Lien, Luca Bartolozzi, Eylon Orbach, Saulo Bambi, Fabio Cianferoni, Giuseppe Mazza, Valerio Sbordoni	Tam Dao National Park, Na Hang Nature Reserve, Hang Kia - Pa Co Nature Reserve

Tab. 1. Collecting sites and staff members of the expeditions to N-Vietnam (2010-2013).

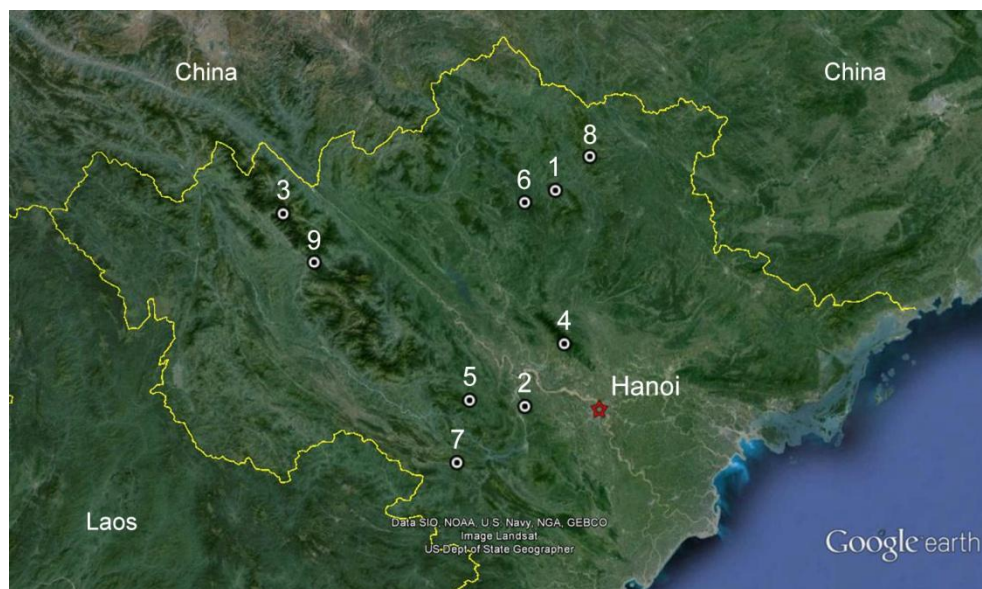


Fig. 1. Collecting sites. 1. Ba Be National Park; 2. Ba Vi National Park; 3. Hoang Lien National Park; 4. Tam Dao National Park; 5. Xuan Son National Park; 6. Na Hang Nature Reserve; 7. Hang Kia - Pa Co Nature Reserve; 8. Phia Oac Nature Reserve; 9. Van Ban Nature Reserve.

Collecting sites

Ba Be National Park (Fig. 2)

This park is located in the Bac Kan Province and was established in 1992. It covers a surface of about 100 square kilometers around the Ba Be Lake. The lake is surrounded by limestone hills, reaching over 1500 m a.s.l., covered by evergreen forests. We collected around the Park Headquarter, at about 350 m a.s.l.



Fig. 2. Ba Be National Park (photo S. Bambi).



Fig. 3. Ba Vi National Park (photo S. Bambi).



Fig. 4. Hoang Lien National Park (photo S. Bambi).



Fig. 5. Tam Dao National Park (photo S. Bambi).



Fig. 6. Xuan Son National Park (photo S. Bambi).

Ba Vi National Park (Fig. 3)

This park is located in the Ha Noi Province, about 50 kilometers west of Hanoi and was a French hill station during the colonial period. The national park was established in 1991, with a surface area of about 114 square kilometers. It is an isolated limestone and soil mountain covered with forest. We collected around the Ba Vi Guest House at about 400 m a.s.l. and areas of 600-800 m a.s.l. and at Vua Peak (1290 m a.s.l.).

Hoang Lien National Park (Fig. 4)

This park is situated in two provinces, Lao Cai and Lai Chau, and contains the largest range of mountains in the north of Vietnam, of varying altitudes. The National Park was established in 2006 and covers a surface of about 300 square kilometers. The highest peak is Fansipan (3143 m a.s.l.), which is also the highest mountain in Vietnam. We mainly collected in the surroundings of the Sa Pa pass (about 1900 m a.s.l.) and Cat Cat village (about 1250-1350 m a.s.l.) in the Lao Cai Province.

Tam Dao National Park (Fig. 5)

This well known national park, established in 1996, is located in the Vinh Phuc Province, on a mountain range (maximum elevation 1592 m a.s.l.) rich in endemic species. The slopes of the mountain are covered with natural forest for about 220 square kilometers. This park was visited several times by our expeditions over different years and most of the collecting was done along a path starting from the small town of Tam Dao, around 950 m a.s.l.

Xuan Son National Park (Fig. 6)

This park, established in 2002, is located in the Phu Tho Province, and it covers an area of mountains and forests of about 150 square kilometers. This park was visited twice by our expeditions and most of the collecting was done around the small village of Xom Du, at an altitude of about 500 m a.s.l.



Fig. 7. Na Hang Nature Reserve (photo S. Bambi).



Fig. 8. Hang Kia - Pa Co Nature Reserve (photo F. Cianferoni).



Fig. 9. Phia Oac Nature Reserve (photo S. Bambi).



Fig. 10. Van Ban Nature Reserve (photo S. Bambi).

Na Hang Nature Reserve (Fig. 7)

The reserve, established in 1994, is located in the Tuyen Quang Province and covers an area of about 220 square kilometers. The landscape is composed of limestone hills and mountains and the majority of the area is located at 300-800 m a.s.l., with the highest peak reaching 1067 m a.s.l. We collected inside the forest near the dam, at about 150 m a.s.l.

Hang Kia - Pa Co Nature Reserve (Fig. 8)

This reserve is located in the Hoa Binh province and extends for around 70 square kilometers. The site is a limestone range which reaches 1500 m a.s.l. in the north western part of the area and decreases in altitude eastwards. We collected in several spots not far from the head quarters of the reserve, at an altitude varying from 700 to 1200 m a.s.l.

Phia Oac Nature Reserve (Fig. 9)

The reserve was established in 1986, is located in the Cao Bang province and extends for about 100 square kilometers. The area is covered by primary and secondary forest; the reserve reaches 1900 m a.s.l. We collected along the road to the peak of Phia Oac (1900 m) and near the salmon rearing farm (about 800-1000 m a.s.l.).

Van Ban Nature Reserve (Fig. 10)

This reserve was established in 2007 and is located in the Lao Cai Province, not far from the Hoang Lien National Park. The reserve has a surface of about 256 square kilometers; the area is covered by primary and secondary forests reaching up about 2000 m a.s.l. We collected along a trail inside a secondary forest at an altitude of about 1000 m a.s.l.

The authors of the present contribution took part in some, if not all, the expeditions, each one as specialist of a different group of Hexapoda; one of us (SB), being the photographer of the Natural History Museum of Florence, had the duty of documenting the different aspects of the trips and taking close-up pictures of the most interesting insects.

We believe it useful to list (Tab. 2) the material collected during the four expeditions to northern Vietnam (2010-2013) because only a relatively small part of it has already been studied (e.g. Coleoptera Brentidae, Cerambycidae, Hybosoridae, Staphylinidae Aleocharinae, Staphylinidae Xantholininae, Lucanidae, Cetoniidae, Cicindelidae, Dytiscidae, Eulichadidae, Elmidae, Dryopidae, Histeridae, Trogidae; Hymenoptera Formicidae, Tiphiidae; Diptera Phoridae; Hemiptera Gerromorpha, Nepomorpha and Leptopodomorpha; Phasmida; Lepidoptera).

We shall be glad to send specimens on loan for identification to specialists who request material of other families for scientific research.

taxa	2010	2011	2012	2013
COLEOPTERA				
Aderidae	1	-	-	-
Anobiidae	6	3	-	-
Anthicidae	1	8	19	1
Anthribidae	67	41	12	13
Apionidae	-	1	-	7
Aphodiidae	60	142	16	13
Attelabidae	10	56	3	16
Bostrichidae	3	5	7	6
Brentidae	11	27	19	17
Buprestidae	16	13	6	16
Cantharidae	13	114	14	18
Carabidae	55	143	39	58

Cerambycidae	98	617	163	150
Ceratocanthidae	-	2	-	-
Cetoniidae	10	13	14	5
Chelonaridae	9	10	-	14
Chryptophagidae	2	-	-	-
Chrysomelidae	174	341	142	258
Cicindelidae	72	43	62	165
Ciidae	-	2	-	-
Cleridae	-	20	31	33
Coccinellidae	40	73	59	51
Colydiidae	9	8	2	-
Cucujidae	19	7	1	1
Curculionidae	128	334	80	207
Cybocephalidae	1	-	-	-
Dascillidae	2	2	-	-
Dermestidae	-	-	6	-
Dryopidae	2	62	12	5
Dynastidae	19	8	14	6
Dytiscidae	62	124	45	8
Elateridae	204	224	162	195
Elmidae	57	12	2	2
Endomychidae	-	15	-	-
Erotylidae	3	9	2	8
Euchiridae	2	3	11	-
Eulichadidae	24	21	4	5
Georyssidae	1	-	-	-
Gyrinidae	1	13	5	-
Haliplidae	1	16	-	-
Helophoridae	-	5	-	-
Heteroceridae	32	97	-	-
Histeridae	3	2	-	1
Hybosoridae	40	25	44	101
Hydrophilidae s.l.	60	102	32	20
Lampyridae	5	15	4	14
Languridae	8	29	27	44
Lathrididae	2	1	1	-
Leiodidae	-	3	-	-
Limnichidae	-	1	-	-
Lucanidae	68	25	23	26
Lycidae	20	-	4	17
Lymexilionidae	5	7	9	2
Malachidae	6	2	-	5
Meloidae	22	17	4	3
Melolonthidae	204	256	90	16
Melyridae	-	2	-	12
Mordellidae	7	-	1	7
Nitidulidae	36	31	11	11
Noteridae	3	-	-	-
Oedemeridae	1	7	-	5
Ostomidae	9	9	1	3
Passalidae	10	32	13	4
Pedilidae	-	1	-	-
Platypodidae	20	17	7	9
Pselaphidae	7	19	1	6
Psephenidae	-	3	1	4

Ptilodactylidae	-	10	-	5
Ptiniidae	-	-	-	1
Pyrochroidae	-	1	-	-
Rhipiceridae	-	8	3	1
Rutelidae	147	271	93	63
Scaphididae	-	10	4	1
Scarabaeidae	62	23	37	34
Scolytidae	38	10	-	13
Silphidae	-	12	3	-
Sphaeridiidae	-	-	1	-
Staphylinidae	44	130	70	60
Tenebrionidae	3	217	27	75
Thorictidae	-	3	-	-
Trichidae	1	1	11	4
Trictenotomidae	-	3	-	-
Trogidae	1	1	-	1
DIPTERA				
Agromyzidae	5	-	-	-
Anthomyzidae	3	1	-	-
Asilidae	23	15	11	18
Athericidae	1	-	-	-
Bibionidae	-	-	-	1
Bolitophilidae	-	-	-	1
Bombyliidae	2	1	-	-
Calliphoridae	2	26	-	4
Cecidomyiidae	3	-	-	-
Celyphidae	-	1	-	-
Ceratopogonidae	26	4	-	-
Chloropidae	50	21	-	4
Clusiidae	3	-	-	-
Cryptochetidae	-	37	-	-
Culicidae	1	-	-	-
Diopside	1	-	1	-
Dolichopodiidae	34	62	-	3
Drosophilidae	22	7	-	-
Empididae	2	6	-	4
Ephydriidae	2	2	-	5
Hybotidae	8	-	-	1
Keroplastidae	1	-	-	-
Lauxaniidae	6	4	-	4
Limoniidae	-	-	-	2
Lonchaeidae	22	2	-	2
Megamerinidae	-	1	-	-
Micropezidae	-	2	-	3
Milichiidae	17	-	-	-
Muscidae	16	295	1	9
Neriidae	3	1	-	-
Nothibidae	1	-	-	-
Oestridae	-	-	-	1
Pipunculidae	1	1	-	-
Platystomatidae	1	6	-	3
Pseudopomyzidae	5	-	-	-
Psychodidae	7	2	-	-
Pyrgotidae	-	2	2	2
Rhagionidae	1	1	-	6

Sarcophagidae	-	-	2	3
Scatopsidae	1	-	-	-
Sciaridae	22	-	-	-
Sepsidae	11	85	-	8
Simuliidae	5	15	-	2
Sphaeroceridae	49	306	-	-
Stratiomyiidae	8	12	4	21
Strongylophthalmyiidae	2	-	-	-
Syrphidae	20	47	6	12
Tabanidae	32	14	10	16
Tachinidae	11	15	4	7
Tanypezidae	-	1	-	-
Tephritidae	3	-	-	10
Tipulidae	2	6	-	6
Ulidiidae	1	-	-	-
Xylomyiidae	-	1	-	-
HEMIPTERA				
HETEROPTERA				
Alydidae	-	1	-	5
Anthracoridae	1	1	-	-
Aradidae	2	13	1	-
Belostomatidae	-	17	-	8
Coreidae	5	10	14	12
Corixidae	-	48	8	10
Cydnidae	4	8	1	17
Dinidoridae	-	4	-	1
Dipsocoridae	5	-	-	-
Gelastocoridae	-	-	-	68
Gerridae	19	12	143	236
Hebridae	-	-	-	12
Helotrephidae	-	-	-	7
Hydrometridae	-	5	3	8
Largidae	1	-	-	-
Lygaeidae	12	7	1	20
Mesoveliidae	-	-	-	4
Micronectidae	1	4	14	7
Miridae	18	5	3	16
Nabidae	-	2	2	1
Naucoridae	-	-	-	2
Nepidae	-	1	1	9
Notonectidae	1	6	-	-
Ochteridae	-	-	-	5
Pentatomidae	11	28	6	20
Plataspidae	2	6	-	3
Pleidae	-	2	1	-
Pyrrhocoridae	5	4	1	11
Reduviidae	9	12	6	12
Rhopalidae	-	-	1	-
Saldidae	-	-	-	2
Scutelleridae	1	5	2	3
Tesseratomidae	-	2	3	-
Urostylidae	-	4	-	-
Veliidae	15	2	143	236
CICADOMORPHA				
Aphrophoridae	-	2	1	1

Cercopidae	7	21	3	10
Cicadellidae	25	23	6	23
Cicadiidae	14	21	7	13
Membracidae	3	4	2	5
FULGOROMORPHA				
Ciixidae	-	1	-	4
Delphacidae	-	2	-	-
Dictyopharidae	1	-	-	1
Eurybrachidae	-	-	1	-
Flatidae	1	-	1	-
Fulgoridae	1	6	-	1
Issidae	1	-	1	1
Nogodinidae	-	-	-	1
Ricaniidae	3	4	3	4
Tropiduchidae	1	-	-	-
HYMENOPTERA				
Apoidea	1	5	4	14
Braconidae	-	-	1	11
Chrysididae	4	1	-	-
Eumenidae	267	1	1	1
Evanidae	-	4	1	4
Formicidae	15	321	159	189
Ichneumonidae	17	29	20	40
Mutillidae	10	5	1	4
Platygasteridae	-	-	1	-
Pompilidae	9	11	2	6
Scoliidae	11	1	-	-
Sphaecidae	3	4	11	5
Tiphiidae	19	3	-	2
Vespidae	9	-	11	14
LEPIDOPTERA				
Papilionidae	50	83	75	60
Pieridae	60	136	84	70
Nymphalidae	200	373	316	140
Lycaenidae	80	149	131	110
Hesperiidae	40	59	55	30
Saturniidae	15	65	34	19
Brahmaeidae	3	3	11	3
Sphingidae	6	95	143	12
Other families	15	1331	707	6
ODONATA				
ZYGOPTERA				
Amphipterygidae	1	-	1	-
Caliphaeidae	-	-	1	-
Chlorocyphidae	5	-	4	-
Calopterygidae	2	2	1	4
Euphaeidae	13	8	7	5
Lestidae	1	2	1	-
Coenagrionidae	3	10	7	4
Platycnemidae	15	-	8	19
Platystictidae	-	-	1	3
Protoneuridae	1	-	-	-
ANISOPTERA				
Aeshnidae	-	-	2	-
Gomphidae	1	-	1	2

Cordulegastridae	-	1	-	-
Chlorogomphidae	-	-	1	-
Corduliidae	2	-	4	3
Libellulidae	48	25	30	22
BLATTODEA	35	-	1	11
COLLEMBOLA	1	-	1	1
DERMAPTERA	15	30	32	15
ISOPTERA	1	44	30	33
MANTODEA	28	22	2	25
MECOPTERA	1	6	-	9
NEUROPTERA	30	30	31	14
ORTHOPTERA	17	9	11	25
PHASMIDA	6	4	5	21
PLECOPTERA	1	1	-	1
PSOCOPTERA	-	-	-	3
THYSANOPTERA	-	-	-	3
THYSANURA	-	12	-	-
TRICHOPTERA	-	1	-	2

Tab. 2. Insects collected in northern Vietnam during the four expeditions.

Materials and methods

Different collecting methods were used: the daytime collecting was done using sweeping nets, butterfly nets, beating trays, hand picking on trunks, leaves, flowers, under stones and barks (Fig. 11), or sifting the forest litter (Fig. 12).



Fig. 11. Collecting insects on barks, Tam Dao National Park (photo S. Bambi).



Fig. 12. Forest litter sifting, Van Ban Nature Reserve (photo S. Bambi).



Fig. 13. Malaise trap, Ba Be Nature Reserve (photo S. Bambi).

In some localities Malaise traps (Fig. 13) were placed; in a few cases pitfall traps were also used. At night a generator was used to feed a bulb of 200 W in a light trap with four sectors (Fig. 14). The collected material was preserved in plastic bottles with cork saw dust and ethyl acetate or in 70% alcohol, apart from a few samples in pure alcohol for DNA analysis.

During the expeditions special emphasis was placed on investigating several groups of insects, due to the presence of specialists and taxonomists among the members of the staff. We believe it useful to provide general remarks and a few interesting observations on some of the studied groups here.



Fig. 14. Light trap, Tam Dao National Park (photo S. Bambi).

Research on stag beetles (Coleoptera Lucanidae)

The present count of this family of Scarabaeoidea is 118 genera and about 1750 species worldwide. The main characteristics of the Lucanidae are the geniculate antenna, with the segments of antennal club fixed and not capable of being tightly closed together, and the strong sexual dimorphism and allometry which are present throughout most of the species. The size can vary from less than one to more than ten centimeters.

Vietnam is particularly rich in stag beetles: around 180 species, belonging to about 25 genera, are quoted for the country to date. The endemism rate is rather high, due to the presence of a large amount of habitats and different climate ranges from South to North; the presence of isolated mountains has also been an important factor for speciation.

During the last years many papers dealing with the Lucanidae of Vietnam have been published, and many new species have been described (NAGAI, 1996; IKEDA 1997a, 1997b, 1997c, 2000a, 2000b; BABA, 2000; ZILIOI, 1998; SUZUKI, 2001; DANG & TRAN, 2003; ARNAUD & MIYASHITA, 2006; FUJITA, 2009, 2010; KATSURA & GIANG, 2002; MAEDA, 2009, 2010, 2012; NAGAI & MAEDA, 2010; OKUDA, 2009a, 2009b, 2012; SCHENK, 2012, 2013a, 2013b; QUANG THAI, 2013; QUANGTHAI & SCHENK, 2013).

Stag beetle collecting in equatorial and tropical countries is mainly done at night, with the use of a light trap, as most of the lucanid species are nocturnal. The Lucanidae fauna of Northern Vietnam has several species in common with Southern China, whilst the fauna in the South becomes more typically tropical. For instance, in the North we collected several species of the Palaearctic genus *Lucanus* Scopoli, 1763, such as *Lucanus planeti* Planet, 1899 (Fig. 15) and *L. kraatzi giangae* Ikeda, 1997 in Phia Oac Nature Reserve, and *L. nobilis* Didier, 1925 in Hoang Lien National Park. In Phia Oac Nature Reserve we collected at light several specimens of one of the largest stag beetles inhabiting Vietnam, *Odontolabis cuvera* Hope, 1842. In the genus *Odontolabis* Hope, 1842 sexual dimorphism is very high, as is the allometry in males. The small males have small mandibles and are more similar to females (Fig. 16), whilst large males show impressive large and strong mandibles (Fig. 17). In Tam Dao National Park we collected another very large species, *Prosopocoilus confucius* (Hope, 1842); in this species the large males (Fig.18) have mandibles which are longer and more slender than in *Odontolabis cuvera*.

In general stag beetles do not fly during the day, but in Tam Dao National Park we observed a large male of *Odontolabis cuvera* flying at noon during a sunny day. During the day it is possible to find some specimens of Lucanidae in dead wood or walking on trunks or on the ground; e.g. in Xuan Son National Park two specimens of *Nigidionus parryi* (Bates, 1866) were found inside a decaying standing tree; in Tam Dao National Park some males of *Neolucanus opacus* Boileau, 1899 (Fig. 19) were found on the trunk of a living tree. In the genera *Figulus* Macleay, 1819 and *Nigidius* Macleay, 1819 sexual dimorphism is absent; in specimens belonging to those genera the sex can be recognized only dissecting the genitalia, as the external morphology is the same in males and females.

Generally Vietnamese stag beetles are black or dark brown, like *Neolucanus opacus* or *Dorcus antaeus* Hope, 1842 (Fig. 20), but there are also colored species, like for instance *Prosopocoilus suturalis* (Olivier, 1789) (Fig. 21) and *Rhaetulus speciosus kawanoi* Maes, 1996 (Fig. 22) [Note: Fujita (2010) illustrated this species under the name *R. crenatus kawanoi*].



Fig. 15. *Lucanus planeti* Planet, 1899 male, Phia Oac Nature Reserve (photo S. Bambi).



Fig. 16. *Odontolabis cuvera* Hope, 1842 small male, Phia Oac Nature Reserve (photo S. Bambi).



Fig. 17. *Odontolabis cuvera* Hope, 1842 large male, Phia Oac Nature Reserve (photo S. Bambi).



Fig. 18. *Prosopocoilus confucius* (Hope, 1842) male, Tam Dao National Park (photo S. Bambi).



Fig. 19. *Neolucanus opacus* Boileau, 1899 male, Tam Dao National Park (photo S. Bambi).



Fig. 20. *Dorcus antaeus* Hope, 1842 male, Phia Oac Nature Reserve (photo S. Bambi).



Fig. 21. *Prosopocoilus suturalis* (Olivier, 1789) small male, Na Hang Nature Reserve (photo S. Bambi).



Fig. 22. *Rhaetulus speciosus kawanoi* Maes, 1996 large male, Tam Dao National Park (photo S. Bambi).

The family Lucanidae, consisting of species which are saproxylic at the larval stage, is particularly important for the ecology of the forests and in Europe several species have been included in protection laws (e.g. *Lucanus cervus* Linnaeus, 1758).

Research on Coleoptera Brentidae

Brentidae is a beetle family belonging to the superfamily Curculionoidea, counting 296 genera and 1760 species worldwide. Most of the species are uncommon, occasionally found on recently dead or dying trees and tree stumps, or attracted to light at night. The last comprehensive study of the Brentidae of Vietnam was made by KABAKOV (2001), who intensively collected in North Vietnam between 1961 to 1964. Kabakov listed 123 species of Brentidae, after studying more than 3500 specimens, about half of which he collected himself. According to this author, brentids seem to be more abundant in relatively recently cut areas and fire sites. Further studies by different authors (MANTILLERI, 2005, 2007; GOOSSENS, 2008) increased the species number for Vietnam to 147.

Our four expeditions made in North Vietnam concentrated in areas covered by primary or secondary forests within natural reserves and national parks. Four methods were used for collecting Brentidae: hand picking, using a beating tray, dragging a net under branches and trunks of fallen trees and using a light trap at night.

For the light trap we used a mercury vapor bulb and a white sheet. This is a very good method which usually yields the largest amount of specimens and species, since most Brentidae are attracted to light and are rarely encountered during the day. In nearly all of the collecting sites Brentids were collected when the temperature was not too cold and the wind speed was not too high. In Na Hang Nature Reserve we collected for instance large specimens of *Hormocerus reticulatus* (Lund, 1800) (Fig. 23).



Fig. 23. *Hormocerus reticulatus* (Lund, 1800), Na Hang Nature Reserve (photo S. Bambi).



Fig. 24. Fallen tree where several brentid species were collected at Ba Be National Park (photo S. Bambi).



Fig. 25. *Ceocephalus articulatus* (Senna, 1911), male and female, Xuan Son National Park (photo S. Bambi).



Fig. 26. Use of beating sheet at Hang Kia - Pa Co Nature Reserve (photo S. Bambi).



Fig. 27. *Hypomiolispa* sp., Hang Kia - Pa Co Nature Reserve (photo S. Bambi).

Dragging a net under trunk of fallen trees was most successful in Ba Be National Park, where a freshly fallen tree was found adjacent to the road about 300 meters from the park headquarters (Fig. 24). Most species collected on the trunk and branches of this tree were *Cyphagogus* Parry, 1849 (13 specimens) and *Calodromus mellyi* Guérin-Ménéville & Gory, 1832 (3 specimens).

Hand picking was more rarely used in the field, since a very thorough eye search is needed, requiring a lot of concentration, time and energy. However, in Xuan Son National Park, walking at night in the forest and inspecting the trunk of a dying, still standing tree with a torch, we found a mating pair of one of the largest (male reaching 65 mm in length) and most impressive brentid species inhabiting Vietnam, *Ceocephalus articulatus* (Senna, 1911) (Fig.25). Several more visits to the tree over the following days yielded three more specimens of the same species, in addition to a pair of *Ceocephalus antennatus* (Ritsema, 1882).

A beating sheet was only used in the fourth expedition (Fig. 26), and a few specimens of a species of *Hypomiolispa* Kleine, 1918 (Fig. 27) were collected in Hang Kia - Pa Co Nature Reserve. Further use of this method in future collecting trips will certainly increase the amount of Brentidae collected.

Research on butterflies and moths (Lepidoptera)

The butterfly fauna of Vietnam is relatively well known. A checklist of the butterflies (MONASTYRSKII & DEVYATKIN, 2003) as well as part of a series of books dealing with the Rhopalocera families have been published so far (MONASTYRSKII, 2005, 2007, 2011). The biogeography of the butterfly fauna has been analysed by MONASTYRSKII & HOLLOWAY (2013).

Lepidoptera were extensively collected during the four expeditions. The total number of specimens collected amounts to about 4760 of which about 2301 are butterflies and 2459 moths. Some interesting species are illustrated (Figs 28-35).



Fig. 28. *Cigaritis syama latipicta* (Fruhstorfer, 1912) (family Lycaenidae), Ba Vi National Park (photo Vu Van Lien).



Fig. 29. *Stichophthalma howqua tonkiniana* Fruhstorfer, 1901 (family Nymphalidae), Tam Dao National Park (photo Vu Van Lien).



Fig. 30. *Zeltus amasa* (Hewitson, 1865) (family Lycaenidae), Na Hang Nature Reserve (photo S. Bambi).



Fig. 31. *Tarsolepis brunnea* Cai, 1985 (family Notodontidae) with scent pencils organs extended, Hoang Lien National Park (photo S. Bambi).



Fig. 32. *Antheraea castanea* Jordan, 1910 (family Saturniidae), Hoang Lien National Park (photo S. Bambi).

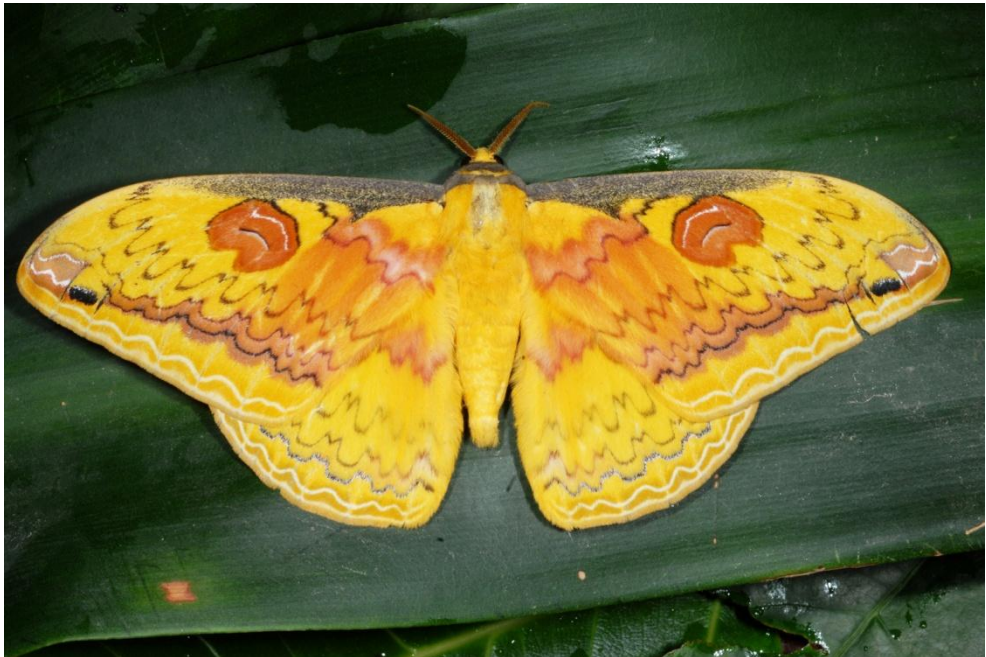


Fig. 33. *Loepa anthera* Jordan 1911 (family Saturniidae), Ba Be National Park (photo S. Bambi).



Fig. 34. *Attacus atlas* (Linnaeus, 1758) (family Saturniidae), Van Ban Nature Reserve (photo S. Bambi).



Fig. 35. *Brahmaea hearseyi* White, 1862 (family Brahmaeidae), Tam Dao National Park (photo S. Bambi).

The total number of recorded species could be roughly estimated to range between 800 and 1000.

The greatest diversity of butterfly species for a single locality was found in Xuan Son National Park in the year 2010, with about 125 species of butterflies (about 100 species during the second visit in 2012). The second locality for species diversity was Na Hang Nature Reserve, visited in 2013, with 104 species. Regarding butterflies, Xuan Son is also the locality where the greatest abundance of specimens was recorded.

The most valuable species were found in the mountains of Hoang Lien, Phia Oac, Tam Dao, Hang Kia – Pa Co. Some of these species, normally rare or uncommon, are worthy of mention. Of the butterflies recorded two are particularly worthy of protection in Vietnam. They are *Teinopalpus imperialis* Hope, 1843 and *T. aureus* Mell, 1923. *T. imperialis* is distributed at higher altitudes than *T. aureus* and further to the South in Vietnam than *T. aureus*. Both species are rare in Vietnam and are found in scattered small populations at moderate and high altitudes where natural forests have been less disturbed. *T. imperialis* has been recorded in Phia Oac, Van Ban and Hoang Lien, whereas *T. aureus* was only recorded in one site during our expeditions (Tam Dao National Park). Both species fly in the early morning, usually 6.00-8.00 a.m. in sunny days, on the mountain tops. They seem to avoid intense sunlight, given that when the weather is overcast they sometimes fly during the day.

In the course of our visits we also encountered rare species of *Papilio*, such as *Papilio bootes* Westwood, 1842; *P. noblei* de Nicéville, 1889; *P. krishna* Moore, 1857.

Byasa crassipes Oberthür, 1893 was observed to be relatively abundant in small forests and flowering spots in Hang Kia village of Hang Kia – Pa Co Nature Reserve. This is a very interesting record because this species is usually very rare. In the same locality other uncommon windmill and batwing species were found, namely *Byasa polyeuctes* (Doubleday, 1842) *Atrophaneura dasarada* (Moore, 1857), and *A. varuna* (White, 1842). Interestingly, the Hang Kia – Pa Co Nature Reserve, which so far has been poorly explored for Lepidoptera, hosts a mixture of Indo-Burmese and Sino-Himalayan fauna, even including Palaearctic elements such as a taxon of the *Artogeia napi* species-group and Vietnamese endemics, like *Penthema michallati* Janet, 1894.

The presence of Palaearctic elements at high elevation on Mount Fansipan and surrounding areas, in the north of Vietnam was already known. We found *Artogeia napi meridionalis* Heyne, 1895 and *A. canidia* (Linnaeus, 1768) quite often around Sa-Pa Pass, at about 2000 m a.s.l. The south-eastern palaearctic species *Nymphalis (Kaniska) canace* (Linnaeus, 1763) was observed as well in this spot.

Among the recorded species some have the status of protected species. Four of them: *Troides helena* (Linnaeus, 1758), *T. aeacus* (Felder, 1860) and the already mentioned *Teinopalpus imperialis* and *T. aureus*, are listed in Appendices II of CITES as endangered species. The Vietnam Red List (2007) also lists two other species of butterflies in need of protection: they are *Byasa crassipes* [quoted as *Atrophaneura crassipes*] and *Papilio noblei*.

As far as moths are concerned, the localities in which we found the greatest abundance and/or diversity were the Van Ban Nature Reserve, the surroundings of Sa-Pa Pass in the Hoang Lien National Park and the Phia Oac Nature Reserve. The Hoang Lien mountain range is also noteworthy due to the presence of endemic species or subspecies of Saturniidae like *Antheraea castanea* Jordan, 1910 (Fig. 32) and *Salassa fansipana* Brechlin, 1997.

The moth-fauna of Vietnam, particularly of the families Noctuidae and Geometridae, is still poorly known, and the collected material that is currently being studied may well include several new species.

Research on water bugs (Hemiptera)

The Hemiptera Heteroptera belonging to the infraorders Gerromorpha, Nepomorpha and Leptopodomorpha are significant groups in terms of water ecosystems (J. POLHEMUS & D. POLHEMUS, 2008) with about 5000 described species and subspecies worldwide. Most of the species inhabit freshwater or marine biotopes and are hence known as "aquatic

Heteroptera" *sensu* J. POLHEMUS & D. POLHEMUS (2008), while a small proportion are not water dependent, and are sometimes strictly terrestrial or xerothermic (especially the Leptopodomorpha).

In Northern Vietnam (Tonkin) the fauna concerning these groups is mainly Oriental, but the presence of typical Palaearctic elements generally restricted to certain high mountain areas should also be stressed.

No comprehensive works on these groups for Vietnam exist so far, but several contributions have already been published. These sources, however, are scattered throughout various literary sources and include few revisions of taxa dedicated to the country (e.g. J. POLHEMUS *et al.*, 2009), contributions with new data specifically for Vietnam or papers including records for this nation (some examples of the most recent are: TRAN & ZETTEL, 2006; TRAN & POLHEMUS, 2009; ZETTEL, 2009; TRAN & POLHEMUS, 2012) or even works on other regions including additional data on Vietnam (e.g. J. POLHEMUS & D. POLHEMUS, 2012; D. POLHEMUS & J. POLHEMUS, 2013), etc.

Our research focused on the aquatic Heteroptera inhabiting the freshwaters in Northern Vietnam. We collected specimens of all the families concerned potentially present in that region (except for those restricted to coastal and marine habitats), with the only exceptions being for Aphelocheiridae (Nepomorpha) and Leptopodidae (Leptopodomorpha).

The Nepomorpha (water bugs) are generally predators living in both still and flowing waters. They range from very small to the largest of all insects (Belostomatidae).

In Vietnam the two small pantropical families Ochteridae and Gelastocoridae (Ochteroidea) are represented respectively by the genera *Ochterus* Latreille, 1807 and *Nerthra* Say, 1832 (Fig. 36).

Within *Ochterus* two distinct ecological groups of species exist, those inhabiting horizontal littoral substrates of mud and sand along lowland still and slow-flowing waters, and those



Fig. 36. *Nerthra* sp. (family Gelastocoridae) nymph, Hang Kia - Pa Co Nature Reserve (photo S. Bambi).

found on vertical seeping rheocrenes and wet rocks in the highlands. These extremely active and agile bugs are very difficult to see and capture; in fact they readily fly as soon as their large eyes detect any movement. For this reason they are often overlooked by general collectors (D. POLHEMUS & J. POLHEMUS, 2012). We mainly collected these insects with a small butterfly net used to trap the bugs on the banks. A slow approach and a lot of patience are however essential in order to catch an adequate number of specimens that will include at least some males (isolated females are usually unidentifiable).

Gelastocoridae, known as "toad bugs", are peculiar insects with large eyes and a rough and sculptured body surface. The species living in forestal areas are often completely covered by mud and dirt and are extremely hard to detect in the field (Fig. 36). Direct collection was the only possible method during our itinerant research in the mountain forest. The use of a pitfall trap, suggested by D. POLHEMUS & J. POLHEMUS (2012), would however have been difficult to carry out in most of the collecting sites because of the sloping terrain and dense vegetation.

After extensive research using light traps near aquatic biotopes no large belostomatids (Belostomatidae, Lethocerinae) were found. These insects seem in fact to be endangered by urban light pollution (they are highly attracted to artificial light) and perhaps also by their use as a human food (cf. YOON *et al.*, 2010; D. POLHEMUS & J. POLHEMUS, 2013a). By contrast, numerous specimens of the genus *Dyplonychus* Laporte, 1833 (Belostomatidae, Belostomatinae) were collected both by using both light traps and water nets in several sites. It is now well evidenced that the species belonging to this genus represent beneficial methods of natural control for mosquitos, hosts of human parasites and certain rice pests (D. POLHEMUS & J. POLHEMUS, 2013a).

Nepids belonging to the genera *Ranatra* Fabricius, 1790 (Nepidae, Ranatrinae) and *Laccotrephes* Stål, 1866 (Nepidae, Nepinae, Fig. 37) were collected by water nets in ponds and streams. These bugs are known as "water scorpions" because of their modified raptorial forelegs and their painful bite.



Fig. 37. *Laccotrephes* sp. (family Nepidae) female, Hang Kia - Pa Co Nature Reserve (photo S. Bambi).

Micronectidae, known also as "pygmy water boatmen", are small aquatic Corixoidea (about 1.2 to 4.5 mm in length) that live in stagnant waters or in quiet parts of streams and rivers. They are very easy to collect by a strainer or a water net, but it is important to ensure a sufficient number of specimens, because in most cases only males are identifiable (N. Nieser, *in litteris*) and a sample (preserved preferably in alcohol rather than being dry-mounted) should include at least three males (NIESER, 2002). Different species belonging to the genus *Micronecta* Kirkaldy, 1897 were collected in several biotopes (e.g. pools, lakes and streams).

Corixidae ("water boatmen"), unlike other Nepomorpha, reach their greatest abundance and diversity in temperate areas while in tropical regions they are apparently replaced by the smaller Micronectidae (NIESER, 2002), and are especially represented in northern Vietnam in highland regions where the habitat becomes Palaearctic. They are more challenging to collect than Micronectidae, because they tend to stay motionless on the bottom, but they escape quickly when disturbed. It is therefore fundamental to follow their movements and try to raise as little mud as possible during the search. Numerous specimens of *Sigara s. l.* were collected during the expeditions.

Some members of the high diverse family Naucoridae, also known as "creeping water bugs" (D. POLHEMUS & J. POLHEMUS, 2013b), were collected using water nets mainly in lowland streams, while no specimens of the related family Aphelocheiridae were found during the research.

The Notonectidae is one of the larger Nepomorphan families (Notonectoidea) and, like in case of the families Pleidae and Helotrephidae (Pleoidea), their members swim belly up, hence the vernacular name of "back-swimmers". Both subfamilies Anisopinae and Notonectinae are well represented in northern Vietnam. The first is represented in the Tonkin region by the genus *Anisops* Spinola. Species of this genus are remarkable for the haemoglobin cells located anteriorly in their abdomen which these insects use to store oxygen reserves during dives. They can regulate the amount of air in order to obtain neutral buoyancy, meaning that they are amongst the few truly planktonic insects. By contrast, members of the subfamily Notonectinae cannot regulate their air store, so they tend to float upwards when not actively swimming and in any case they have to come up to the surface to store a reserve of air (NIESER, 2004). Because of these different ways of life Notonectinae are easier to collect than Anisopinae, which must also be searched for in deep waters. Several specimens of *Anisops* Spinola, 1837 (Anisopinae) and *Enithares* Spinola, 1837 (Notonectinae) were collected mainly from small pools and man-made containers.

The Pleidae, "pygmy back-swimmers", are small insects of about 1.3-2.5 mm long that require, unlike Notonectidae, dense aquatic vegetation. They are simple to collect, but they can often be overlooked if scooped up in a net with vegetation, given that they tend to be still. A solution could be to put the vegetation directly in a large tray with water and wait for the insects to begin to swim again before gathering them with a tea strainer or a very small net (NIESER, 2004). Specimens belonging to the genus *Paraplea* Esaki & China, 1928 were collected through strainers and nets in the aquatic vegetation.

The Helotrephidae are a sister group of Pleidae, and are small, typically semiglobular insects living mainly in flowing waters but also in lentic waters such as ponds, lakes, pools, lithotels, or even small artificial bodies of water (ZETTEL *et al.*, 2011). Members of this family were found in a torrent in the "Na Hang" Nature Reserve (Tuyen Quang Province).

The Gerromorpha (semiaquatic bugs) is a strikingly diverse heteropteran infraorder in terms of morphology, ecology, and life history adaptations (ANDERSEN, 1982). The members of this group tend to live on the water surface on which they have the ability to walk.

Members of the family Mesoveliidae are small semi-aquatic bugs commonly known as "water treaders" or "pondweed bugs". They usually live on marginal floating vegetation amid stagnant water, slow-flowing streams or soil or leaf debris in wet forest (YANG & MURPHY, 2011).

The Hebridae ("velvet water bugs") are small Gerromorpha (about 1.3-3.5 mm). They are not frequently encountered by collectors due to their minuteness and often secretive habits (SCHUH & SLATER, 1995). We collected members of this family as they walked on the water surface of small forest pools.

A group of very distinctive bugs (known as “watermeasurers” or “marsh treaders”) is represented by the members belonging to the genus *Hydrometra* Latreille, 1796 (family Hydrometridae) characterized by an elongated body, and eyes situated far behind the anterior margin of a strangely-shaped head. The most common and widespread species are found in both lowland and highland habitats, whilst a few show a preference for streams in forests of varying altitudes (cf. YANG & ZETTEL, 2005). They are relatively simple to collect on wet soil due to their slow movements; sometimes they might run across the water surface, but they are simply too catch with a water net or a strainer. They can be difficult to find out of water because they stay motionless as a defence mechanism against predators: their slender body and threadlike legs provide a twig-like camouflage among the weeds or debris (YANG & ZETTEL, 2005). Macropterous morphs are attracted by light and can also be collected using a light trap.

According to DAMGAARD (2008; cf. also 2012) the Veliidae family is paraphyletic, and we therefore prefer to deal with the different subfamilies individually. Members of the subfamily *Rhagovelia* Mayr, 1865 live in fast flowing waters, and different species were collected from several streams in northern Vietnam. The limnic genus *Entomovelia* Esaki, 1930 (subfamily Haloveliinae) comprises very small bugs (1.5-1.8 mm) that live in shaded sections of streams with slow flowing waters. The Oriental taxa *Velia* subgenus *Cesavelia* Koçak & Kemal, 2010 (Veliinae) and *Perittopus* Fieber, 1861 (Perittopinae, Fig. 38) inhabit particularly shaded small pools in mountainous streams. Finally, the largest subfamily of Gerromorpha is represented by the Microveliinae s. l. of which to date several species assigned to the genus *Microvelia* Westwood, 1834 have been collected in particular (cf. ANDERSEN *et al.*, 2002).

An interesting specimen (unfortunately only a single nymph) belonging to the oriental genus *Lathriovelia* Andersen, 1989, never previously recorded in Vietnam, was found in a decaying piece of bamboo. Species of this group are in fact specialized inhabitants of the water surface within bamboo internode cavities, and are found exclusively within these container habitats (KOVAC & KROCKE, 2013).

The Gerridae, known also as “pond-skaters” or “water-striders”, can be found in a wide range of freshwater habitats: streams, rivers, lakes, ponds, etc. (CHENG *et al.*, 2001). Members of the subfamily Eotrechinae have a peculiar ecology among Gerridae. They generally inhabit rheocrenes or water splash zones. The specimens of the genus *Eotrechus* Kirkaldy also live on perfectly dry steep rock faces (J. POLHEMUS *et al.*, 2009) and may easily be overlooked. The species belonging to the genus *Amemboa* Esaki, 1925 (Eotrechinae) can instead be found in quiet pools along streams or near stream banks. Both genera were collected during this research from hilly and mountainous areas. Among the subfamily Gerrinae species of the genera *Aquarius* Schellenberg, 1880, *Limnogonus* Stål, 1868 and *Gerris* Fabricius, 1794 were found especially in still waters, while members of the genera *Metrocoris* Mayr, 1865 (Halobatinae) and *Ptilomera* Amyot & Serville, 1843 (Ptilomerinae) were common in the streams.

All members of the Gerromorpha can be collected by simple water nets, but for the smaller taxa it is very useful to use a small strainer (Fig. 39) to better detect the insects once collected, and entomological tweezers to avoid damaging the most delicate species. It is more difficult to hunt for the large gerrids (e.g. *Ptilomera* or *Aquarius*) that requires a strong and long handled net and must often be gathered by directly entering the water.

The Leptopodomorpha are generally long winged bugs, occupying freshwater riparian or littoral zones. Certain species are marine or distinctly halophilic, others are cavernicolous (J. POLHEMUS & D. POLHEMUS, 2012). We collected members of the genus *Rupisalda* J. Polhemus, 1985 (family Saldidae) on wet bedrock faces adjacent to waterfalls (the same biotopes, frequently undersampled, of some gerrids; see above). These insects in fact preferentially inhabit rheocrenes rather than the horizontal littoral habitats preferred by the *Saldula* s. l. species (J. POLHEMUS & D. POLHEMUS, 2012). The shore bugs in particular (family Saldidae) are extremely agile due to a combination of jumping and flight (SCHUH & SLATER, 1995), making them very difficult to collect as noted by BUTLER (1923): “*Much hunting but few Saldas, and he who desires to cultivate the virtue of patience, cannot do better than try a day’s Salda hunting*”.



Fig. 38. *Perittopus* sp. (family Veliidae) apterous specimen, Tam Dao National Park (photo S. Bambi).



Fig. 39. Use of a small strainer to collect Veliidae in Tam Dao National Park (photo S. Bambi).



Fig. 40. *Rhynchophorus ferrugineus* Olivier, 1790 (family Dryophthoridae), two females of different size, Na Hang Nature Reserve (photo S. Bambi).



Fig. 41. *Rhynchophorus ferrugineus* Olivier, 1790 (family Dryophthoridae) female, Tam Dao National Park (photo S. Bambi).

Research on alien species

Those species which have been introduced to areas beyond their natural past or present range of distribution by human agency, whether direct or indirect, intentional or unintentional (Decision VI/23, Convention on Biological Diversity 2002) are today regarded as "alien species". This is one of the most powerful means by which humans transform the planet, and although several alien species have been beneficial to humans or have caused minimal environmental impact, a small but significant fraction of them may turn out to be invasive, becoming agents of human-accelerated environmental change (SIMBERLOFF *et al.*, 2012). The introduction of species is not a new phenomenon but the number of such happenings has increased exponentially over the past century with the 'globalization' of economy and the consequent proliferation of the pathways and routes of introductions (HULME *et al.*, 2008). Insects are one of the taxa with the uppermost frequency of introduction due to their high diversity, biological properties, and close association with human activities.

During our expeditions to Vietnam, we paid special attention to a native species, the red palm weevil (RPW), *Rhynchophorus ferrugineus* Olivier, 1790 (Coleoptera: Dryophthoridae) (Figs 40 and 41). This species attacks palm trees and is one of the worst pests for these trees. The red palm weevil was originally distributed in Southeastern Asia, but it was recently introduced all over the world, including the Mediterranean Basin (FALEIRO, 2006). It is rapidly spreading in central and southern Italy; its first record in Italy, from a nursery in Pistoia (Tuscany), being dated in 2004 (SACCHETTI *et al.*, 2006). Since the RPW is a concealed tissue borer, it is difficult to detect symptoms of its attacks at an early stage of infestation. Preventative measures are thus crucial for the success of any RPW-Integrated Pest Management (IPM) program; and should include sanitation, trapping, chemical and biological control and an increase in public awareness (FALEIRO, 2006).

The development of a biological control component for a successful IPM requires the identification of the natural enemies of the RPW and other *Rhynchophorus* species, including their pathogens. Due to the threats the red palm weevil poses to human economy, several studies and projects have been carried out to manage this species. The PROPALMA project (*Protection of ornamental and indigenous palms* by the RPW, *Rhynchophorus ferrugineus*) is one of the Italian projects intended to protect the heritage of Italian palms by way of eco-friendly techniques.

During our last expedition to Vietnam several red palm weevil specimens were collected, in order to identify their natural enemies in native areas and to test in laboratory conditions for their potential use for RPW-Integrated Pest Management in Italy.

During June 2013, adults were collected in Tam Dao National Park, Na Hang Nature Reserve and Hang Kia - Pa Co Nature Reserve using Cross-Vane Panel Traps (Fig. 42).

The two traps set in every collecting site were baited with the male aggregation pheromone (Rhyfer 220; Intrachem Bio Italia SpA) and inspected every day.



Fig. 42. Cross-Vane Panel Trap used to collect red palm weevils (photo S. Bambi).

During the inspections, the adults were removed from the traps and the sex of each insect was determined using the characteristics of the rostrum, as suggested by WATTANAPONGSIRI (1966). The adults were preserved in 100% ethanol for genetic population studies and for the characterization of the symbiotic microbioma.

In all the sites, we collected adults of RPW with an unbalanced *sex ratio*, according to the literature (reviewed by FALEIRO, 2006).

- Tam Dao National Park (5 males and 9 females);
- Na Hang Nature Reserve (4 males and 8 females);
- Hang Kia - Pa Co Nature Reserve (3 males and 12 females).

The arrival time of adults at traps was non-random (Rayleigh test at $p < 0.05$), as reported also by several authors (reviewed by FALEIRO, 2006), with a bimodal distribution, in which peaks are closer to each other and are both in the afternoon (Fanini L., pers. com.) We also collected other species belonging to Dryophthoridae, awaiting taxonomic identification for the moment. An entomopathogenic fungus was found on an adult dead male but more in-depth studies are necessary for the identification and for the pathogenicity of this strain. Further studies are also necessary for the correct identification of the mite species associated to the weevils and for the discovery of their relationships with RPW.

Photo documentation

We paid special attention to the photo-documentation of our expeditions, thanks to the presence of the professional photographer from the Natural History Museum of Florence (SB); many other good pictures were also taken by other authors (VVL, FF, VS).

There are several difficulties in shooting good pictures of insects in the wild; it is not only necessary to have good technical equipment, but also to be a smart observer and a fast shooter, as most insects are usually very fast to fly away. To be together with a staff of professional entomologists can of course help the photographer, because these individuals know the ecology and behavior of the insects they study. In some circumstances, shooting photos in nature is almost impossible.



Fig. 43. Taking pictures with the photo camera Nikon D2XS (photo F. Fabiano).



Fig. 44. Longhorn beetle (Coleoptera Cerambycidae), Tam Dao National Park (photo S. Bambi).



Fig. 45. Jewel beetle (Coleoptera Buprestidae), Tam Dao National Park (photo S. Bambi).



Fig. 46. Spiny stick insect (Phasmida Phasmatidae), Phia Oac Nature Reserve (photo S. Bambi).



Fig. 47. Lichen-mimic katydid (Orthoptera Tettigoniidae), Hang Kia - Pa Co Nature Reserve (photo S. Bambi).



Fig. 48. *Saiva gemmata* (Westwood, 1848) (Hemiptera Fulgoridae), Ba Be National Park (photo S. Bambi).



Fig. 49. *Xylorhiza adusta* (Wiedemann, 1819) (Coleoptera Cerambycidae), Tam Dao National Park (photo S. Bambi).



Fig. 50. Bug nymph (Hemiptera Tessaratomidae), Ba Be National Park (photo S. Bambi).



Fig. 51. Mating damselflies (Odonata Coenagrionidae), Phia Oac Nature Reserve (photo S. Bambi).



Fig. 52. Forest cockroach (Blattodea), Van Ban Nature Reserve (photo S. Bambi).



Fig. 53. Assassin bug (Hemiptera Reduviidae), Xuan Son National Park (photo S. Bambi).



Fig. 54. Mimic praying mantis (Mantodea), Tam Dao National Park (photo S. Bambi).



Fig. 55. Shield-backed bug (Hemiptera Scutelleridae), Ba Be National Park (photo S. Bambi).



Fig. 56. Hairy caterpillar (Lepidoptera), Tam Dao National Park (photo S. Bambi).



Fig. 57. Long headed caterpillar (Lepidoptera), Hoang Lien National Park (photo S. Bambi).



Fig. 58. Hairy caterpillar (Lepidoptera), Van Ban Nature Reserve (photo S. Bambi).



Fig. 59. Mimic caterpillar (Lepidoptera), Tam Dao National Park (photo S. Bambi).



Fig. 60. The exhibition at the Natural History Museum of Florence (photo S. Bambi).



Fig. 61. The exhibition in Hanoi. From left to right: Assoc. Prof. Dr Pham Van Luc, former Director of VNMN, Prof. Chau Van Minh, President of VAST, Dr Lorenzo Angeloni, Italian Ambassador in Vietnam (photo Vu Van Lien).

In those cases we collected the specimens and took them to a more comfortable place or to the hotel room, where a small "photographic set" was arranged, with leaves, small branches, bark pieces, stones and so on, depending on the biology of the insect to be photographed.

A Nikon D2XS camera was used during the four expeditions, together with macro lenses (60 mm and 105 mm) (Fig. 43). To light small subjects, a Nikon Commander R1C1 flash was used. This kind of professional equipment is particularly suited to wet and hot climates; in fact the high humidity which is present in tropical forests may cause problems to the cameras.

During the trips a large amount of photos were taken: more than 2000, including those of insects, habitats and landscapes. Some examples of the photos taken during the trips are shown in Figs 44-59.

One of the first uses of these images was the realization of two important photo exhibitions. One, held in Florence from 5 to 20 October 2010 in the Natural History Museum, was entitled "*Vietnam: biodiversity Paradise*" (Fig. 60) and was opened in the presence of His Excellency the Ambassador of the Socialist Republic of Vietnam in Italy, Prof. Dang Khanh Thoai, and His Excellency the Ambassador of Italy in Vietnam, Dr Lorenzo Angeloni. The second exhibition was entitled "*Insects of Vietnam*" (Fig. 61) and was held in Hanoi from 16 to 19 December 2010, on the occasion of the Millennium of the City of Hanoi. Both exhibitions were very successful and were highly frequented.

Conclusions

Thanks to the material collected during our expeditions, several scientific papers have already been published (e.g. BONI BARTALUCCI, 2011; BORDONI, 2012; LETARDI *et al.*, 2012, BALLERIO, 2013; PACE, 2013), whilst others still are in preparation. The following new species have been described to date:

Coleoptera HYBOSORIDAE CERATOCANTHINAE:

Madrasostes bartolozzii Ballerio, 2013

Coleoptera STAPHYLINIDAE:

Metolininus bartolozzii Bordoni, 2012

Atheta (Acronota) phuthoensis Pace, 2013

Atheta (Dimetrota) tamdaoensis Pace, 2013

Hymenoptera TYPHIIDAE:

Tiphia lucai Boni Bartalucci, 2011

In agreement with the signed MoUs, the Holotypes of the new taxa are being held in deposit at the Vietnam National Museum of Nature in Hanoi.

The collaboration between the Museum of Natural History of the University of Florence and the Vietnam National Museum of Nature allowed not only for the organization of several scientific expeditions in the field, but also for a seminar lesson on the beetles of Vietnam held in 2010 at the Vietnam National Museum of Nature and the visit of a VAST (Vietnam Academy of Science and Technology) delegation at the Natural History Museum of the University of Florence (8-9 April 2013) (Fig. 62). During the visit the foundations for further collaboration were laid.



Fig. 62. Prof. N.T. Minh (VAST) and Prof. G. Chelazzi (MNH) during the visit of the Vietnamese Delegation at the Natural History Museum of Florence (photo S. Bambi).

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