



Bat conservation at Cat Ba Biosphere Reserve, North-east Vietnam

Final Project Report



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UNIVERSITÄT
TÜBINGEN



Final CLP Project Report

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CLP project information

Project ID:	002206F
Host country:	Vietnam
Site location:	Cat Ba Biosphere Reserve, North-east Vietnam
Dates in the field:	August, 2006 – September, 2007
Names of institutions involved:	<ul style="list-style-type: none">◆ Institute of Ecology and Biological Resources (IEBR), Hanoi, Vietnam◆ Cat Ba National Park (CBNP), Hai Phong, Vietnam◆ Hanoi University of Natural Sciences (HUNS), Vietnam◆ Harrison Institute (HI), Sevenoaks, England◆ University of Tuebingen (UT), Tuebingen, Germany◆ Prince of Songkla University (PSU), Songkla, Thailand◆ Tunghai University (TU), Taiwan◆ University College Dublin (UCD), Ireland
The overall aim of the project:	Species diversity determination and capacity building for promotion of bat conservation
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The CLP project team and external participants attended the bat field workshop in Cat Ba, August 2006 [from Left to right]: **Pham Duc Tien**, Bounsavane (PSU student), **Vuong Tan Tu**, Pipat Soisook (PSU student), Phouthone Kingsada (PSU student), Phansamai Phommexay (PSU student), **Neil M. Furey**, **Vu Dinh Thong**, Paul J.J. Bates (HI Director), **Chiao-Wen Chu**, Lanzinger-Bates Beatrix (HI staff), Ariya Djetaradol (PSU student), and **Juliana Senawi**.

SECTION 1

1.1. EXECUTIVE SUMMARY

This project originally aimed at exploration of the bat fauna of Cat Ba Biosphere Reserve for bat conservation promotion in the area. Its main objectives comprise determination of species diversity, identification of threats to bats and key sites for conservation, and raising the profile of bats with communities. The projects activities focused on four following aspects: capacity building, conservation research, awareness raising, and data dissemination.

- ❖ The team members were well trained in principal techniques relating to conservation. They have specialized in bat research and conservation. Additionally, four other students of Vietnamese universities also received training from the project team for completion of their dissertations in bat taxonomy.
- ❖ Results of the projects conservation research aspect include a determination of bat species diversity of Cat Ba, the discovery of a new bat species to science, a taxonomic confirmation of a new endemic species of Vietnam with an endemic subspecies of Cat Ba island, the first record of a rare bat species in Vietnam. A comprehensive database in bat echolocation and behaviour was also obtained over the project period.
- ❖ The profile of bats with public communities was raised effectively. The project reached substantial efforts in promotion of bat conservation within the area. Its awareness raising campaigns equipped local officials with skills in bat conservation based on essential understanding of bats' roles to human and ecosystems. Conservation recommendations made by project were initially implemented.
- ❖ In fact, the projects achievements far exceed our initial expectations. Our findings were presented at conferences ranging from local to international levels. They have been written as an impressive series of papers for publications in Vietnamese and international peer-reviewed journals.
- ❖ This project had a clear identity. It had a auspicious beginning (preliminary surveys, field workshop), an indicated middle (intensive field surveys to gather data and materials, training workshop), and an on-going end (dissemination of information at conferences, the completion of theses, and the writing scientific papers). The Conservation Leadership Programme has a high profile within the partners and relevant institutions. It is visibly recognized as the principal supporter of this project, and acknowledged (with logo included when possible) in all documentaries for public media (TV, newspaper, websites), presentations and publications.

1.2. INTRODUCTION

The Cat Ba Archipelago Biosphere Reserve (CBABR) includes 360 islands situated in the west of Ha Long Bay. Of which, Cat Ba island and its surroundings were designated as a national park (Furey, 2002). The reserve contains various vegetation types ranging from mangrove to agriculture areas and forests on karst areas.

Those habitats and a large number of cave systems in both Cat Ba and Ha Long Bay are ideal homes to bats. Previously, several faunal surveys suggested that Cat Ba has high biodiversity values, and is a key region for bat research and conservation in Vietnam (Furey, 2002). An endemic bat subspecies of the area *Hipposideros turpis alongensis* was recorded previously (Bourret, 1942; Topal, 1993), but its taxonomic status remained uncertain (Borissenko and Kruskop, 2003). Prior to this project, CBABR received very little attention from scientists in bat research. On the other hand, local officials had little or no understanding of bats' importance to human and ecosystems. As a result, they did not value bats when seeking to preserve the biodiversity in the area. Having recognized those problems, this project expected to explore the bat fauna of CBABR for conservation promotion by undertaking the following programmes:

Capacity building: to equip all project members with essential skills and techniques for bat research and conservation. They got valuable opportunities to learn from international experts in bat taxonomy and echolocation over the project period. Four other students (three from Hanoi University of Natural Sciences and one from Tay Bac University), northern Vietnam also received the training from the project members in bat taxonomy and conservation biology for completion of their BSc dissertations.

In addition, local officials (rangers, authorities, school teachers and others) within the reserve’s area also participated in the bat field and training workshops and other project activities. Subsequently, they understood bats’ importance to ecosystems and grew interested in conservations of key sites.



Map of the Cat Ba Archipelago Biosphere Reserve

Conservation research: to gather necessary materials and data from a series of field surveys for determination of species diversity, and for assessments of major threats to bats of CBABR. Results from this research provided important data and relevant information for making practical solutions for bat conservation within the reserve.

Awareness raising: to raise the profile of bats with public communities and scientific communities. Informal and formal meetings between the project members and local officials were organized for provide updated findings and relevant information about the bat fauna of CBABR. The projects information and obtained results were also introduced to university students and local school pupils. A series of newspaper articles, TV documentaries, and other conservation materials (T-shirts, mugs, posters) were also produced by the project to enhance efforts in conservation education.

Dissemination of the projects information and findings: The projects information and results were presented at conferences, workshops, and meetings. Confirmed achievements have also been written as a series of papers for publications in Vietnamese and international peer-reviewed journals.

1.3. PROJECT PARTNERS AND THEIR ROLES

It is clear that CLP is the principal supporter of this project. In addition, the project also received effective collaborations and valuable training from the following partners.

- ❖ **IEBR** provided necessary permits and relevant works for the projects implementation; offered laboratories for the team members to analyze materials, and to train external university students in bat taxonomy. The project members from IEBC collaborated with CBNP, HI, and PSU in co-

hosting an international bat field workshop in Cat Ba island in August 2006, and producing three TV documentaries and other newspaper articles on bats of CBABR.

- ❖ **CBNP** kindly provided research stations for the project team to conduct successfully all projects programmes in the field. Two staff and rangers of CBNP joined those programmes, particularly participated in field surveys.
- ❖ **HI** jointly funded the training of project members in field survey techniques and bat taxonomy; trained the project members in writing articles to public media and scientific papers for publications in international peer-reviewed journals. Other roles of HI with support from the Darwin Initiative project are described above.
- ❖ **UT** collaborated with IEBR, HI, and CBNP in the training of project members in bat echolocation and behaviour; jointly funded for additional field surveys to gather necessary materials and data for correct classification of bat species and their behaviour, and for identification of key sites for bat conservation.
- ❖ **PSU** offered opportunities for its students to participate in the international bat field workshop in Cat Ba island in August 2006. Since then, those students and the project members have been in close relationships, and worked effectively on subjects relating to the project programmes.
- ❖ **TU** provided opportunities for a project member, Ms Chiao-Wen Chu, to join the bat field workshop in Cat Ba island, and subsequently helped her in improving research techniques.
- ❖ **UCD** offered laboratories for analyses of tissue samples collected during the project period. Those analyses contributed important data to both research and conservation aspects of the project.

The project also received valuable collaboration and support of the CBLCP for hosting a training workshop on bat security and conservation. Other experts and institutions collaborated with the project team in co-writing papers for publications are given in Section 4.

1.4. PROJECT MEMBERS

- ◆ **Mr Vu Dinh Thong** has a permanent post as a full time bat researcher at IEBR, and is working closely with colleagues of the above partners and other institutions, comprising Hungarian Natural History Museum (Hungary), Aberdeen University (United Kingdom), National University of Laos, Texas Tech University (USA), Royal University of Phnom Penh (Cambodia), Taipei Zoo (Taiwan), Chinese Academy of Sciences, Northeast Normal University (China), Guangzhou University (China), Fly By Night Bat Surveys (Australia), Biodiversity Institute of Ontario (Canada), and Yamaguchi University (Japan). He has worked on bats since 1998, and led successfully seven bat projects (two were supported by CLP, one was supported by Bat Conservation International, and four others were supported by Vietnamese institutions). He is registered for his PhD at University of Tuebingen, Germany, which is currently scheduled for completion by February 2011. His thesis, which is being prepared as at least eight papers, focuses on taxonomy and echolocation of Vietnamese bats. He has published twenty three papers on bats in Vietnamese peer-reviewed journals, seven papers in international peer-reviewed journals. Of which, he is principal author of eighteen papers, and co-author of other twelve including the naming of three new bat species. In



Vu Dinh Thong securing a bat injured by the nets of illegal bird hunters in Cat Ba

addition, he recently submitted three manuscripts to international peer-reviewed journals, and currently completed five other manuscripts for a submission soon, including descriptions of one new subspecies and two new bat species. He also presented his study results on Vietnamese bats at seven international conferences on mammals, bats and conservation biology, and at nine national conferences on biodiversity in Vietnam. As a project leader, he led successfully all field surveys and other projects programmes.

- ◆ **Mr Pham Duc Tien** also has a full time post as a mammal researcher in IEBR. He has worked on Vietnamese bats since 1997, and has published thirty five papers in Vietnamese and international peer-reviewed journals. His papers focused on Vietnamese mammals, including a paper describing a new bat species. He is outstandingly experienced in field surveys and played essential roles in conducting the project activities in Cat Ba island.



Pham Duc Tien (right) with Prof. Dr. Hans-Ulrich Schnitzler of UT (left) in Cat Ba

- ◆ **Dr Neil M. Furey** is an international expert in capacity-building, awareness-raising and conservation research. He supervised Mr Vuong Tan Tu and two other Vietnamese students through field surveys and other programmes. He has led successfully a number of projects on Conservation of Karst Ecosystems in north Vietnam, published a series of papers in both Vietnamese and international peer-reviewed journals, including descriptions of five new bat species. He is currently working for FFI in Cambodia-Cambodia Programme. Dr Furey works closely with Vu Dinh Thong, and provided valuable suggestions for this project implementation.



Neil Furey (third from left) working with MSc students of PSU in Cat Ba

- ◆ **Mr Vuong Tan Tu** is a young researcher of IEBR. He joined the projects conservation research programme. He has participated in and presented his bat research at a national conference on biodiversity (organized by IEBR in 2007) and an international bat conference in Phuket (co-organized by HI, MBCRU, and PSU in 2007). He is recently registered at Sciences de la Nature et de l'Homme (Paris) for his PhD, which is scheduled for completion in 2014.



Vuong Tan Tu (right) and Dao Ngoc Hieu of CBNP (left) removing a bat from harp trap

- ◆ **Ms Cao Thi Thanh Nga** was an MSc student of the Hanoi University of Sciences. She studied on environmental protection for her MSc degree. Subsequently, she joined the projects programmes and became a key member.

- ◆ **Ms Chiao-Wen Chu** is a staff of the Taipei Zoo, Taiwan. She is experienced in ecology and molecular systematics of bats. She has joined the international bat field workshop in Cat Ba and trained other project members the basic techniques in collecting tissue samples for molecular data. She has also presented her bat research in Taiwan and at a range of international conferences, published a series of papers in scientific journals.
- ◆ **Ms Juliana Senawi** is well experienced in bat ecology and echolocation studies. She joined the international bat field workshop in Cat Ba and trained several project members in field survey techniques. She is registered for her PhD at Texas Tech University (under the supervision of Dr Tigga Kingston).
- ◆ **Ms Nguyen Thi Quynh Chau** was an MSc student of Hanoi University of Sciences. She initially joined the projects conservation research programme, and was also trained in bat taxonomy. Afterwards, she got good position at the National Institute of Animal Husbandry, but is still interested in bat research and conservation.



Chiao-Wen Chu (left) and Juliana Senawi (right) in Cat Ba

SECTION 2

2.1. AIM AND OBJECTIVES

This project initially aimed at exploration of the bat fauna of Cat Ba and conservation promotion. Its specific objectives include conducting field surveys for species diversity determination, identifying key sites and main threats to bats for conservation, recommending conservation solutions to local people, initiating pride amongst local communities in environmental protection, producing guides to bats of Cat Ba for rangers's use, and disseminating information widely (reports and scientific papers).

2.2. METHODOLOGY

Bat capture and identification: Bats were captured using four-blank harp traps and mist nets in various sizes (2.6 m [height], 3–12 m [length]). The traps and nets were set up beside cave entrances, across footpaths and narrow streams under forest canopies. Mist nets were attended at all times and harp traps inspected regularly. Each captured bat was removed carefully from the trap or net, then held individually in a cotton bag, measured, weighed, photographed, identified and released. Biopsy tissue samples from the wing membrane were taken and stored in 70–100% alcohol for molecular genetic studies. Subsequently, the tissue samples were sent to the University College Dublin for analyses. A



Chiao-Wen Chu (right) and Dr Paul Bates of HI (left) taking measurements of captured bats in Cat Ba

small number of individual bats that could not be identified in the field on the basis of external characters were taken as voucher specimens for study in IEBR in conjunction with international experts. Skulls of all voucher specimens and bacula of the male specimens were removed and cleaned for craniodental measurements and bacular features, respectively. Captured bats were classified based on morphological and craniodental measurements, and bacular features (Bates and Harrison, 1997; Borissenko and Kruskop, 2003; Csorba et al., 2003). Molecular data were also used to confirm the taxonomic status of bat taxa of Cat Ba.

Echolocation recording and analyses:

echolocation calls of all captured bats were obtained from manual recordings in three situations (handheld, flying, and resting) using five Pettersson D-240x bat detectors and one PCTape system (custom-made by UT). In addition, long-term recordings were also made in natural habitats (in front of caves, under forest canopies) to obtain data on bat echolocation behaviour. Batman software (custom-made by UT), which displays detected sounds with bat calls, was used to obtain the sound sequences with high quality signals. Sequences recorded from those situations were selected for analysis using Selena software (University of Tübingen, Germany).



Chiao-Wen Chu (centre) with Dr Paul Bates of HI (left) and Pipat Soisook of PSU (right) recoding echolocation calls of captured bats in Cat Ba

Bat roost size: estimates of population size were made from roost counts using binoculars, digital cameras. Manual counters were also used to count bat individuals when they left the caves in the evening. In addition, continuous recordings of echolocation made in front of the cave also provided supplemental data for estimation.

Local attitudes to bats: interviews and informal meetings were carried out to determine how local people interact with bats. Conservation materials (T-shirts and posters) were subsequently distributed to promote an understanding of bats. The project team also collaborated with public media in producing TV documentaries, newspaper articles in order to raise local people's understanding of bat conservation.

Promoting bat conservation: team members met local authorities and rangers and discuss with the most important findings of the project. With kind collaboration and valuable support from CBLCP, a training workshop on bat security and conservation was organised to provide the local rangers, authorities and other officials with practical techniques to secure bats from nets of illegal bird hunters.



A training workshop on bat security and conservation in Cat Ba co-hosted by CLP project and CBLCP

Dissemination of the projects data and findings: the project information with obtained results were written as poster and oral presentations at conferences, reports with illustrated photos of bats for use of local rangers and authorities, a range of scientific papers for publications in peer-reviewed journals.

2.3. OUTPUTS AND RESULTS

The project successfully reached all initial outputs and results. In fact, our achievements far exceeded the initial expectations. Below are their concise descriptions corresponding to each of the projects original objectives:

2.3.1. Determination of bat species diversity: a total of 27 species belonging to 13 genera, 5 families (listed below) were recorded over the project period, including a new bat species *Hipposideros* sp. nov. and the first record of *H. khaokhouayensis* in Vietnam.

- | | |
|--|---|
| <p>Pteropodidae Gray, 1821</p> <ol style="list-style-type: none"> 1. <i>Cynopterus sphinx</i> (Vahl, 1797) 2. <i>Rousettus amplexicaudatus</i> (Geoffroy, 1810) <p>Rhinolophidae Gray, 1825</p> <ol style="list-style-type: none"> 3. <i>Rhinolophus marshalli</i> Thonglongya, 1973 4. <i>R. macrotis</i> Blyth, 1844 5. <i>R. pearsonii</i> Horsfield, 1851 6. <i>R. pusillus</i> Temminck, 1834 7. <i>R. affinis</i> Horsfield, 1823 <p>Hipposideridae Miller, 1907</p> <ol style="list-style-type: none"> 8. <i>Hipposideros</i> sp. nov. 9. <i>H. pomona</i> Andersen, 1918 10. <i>H. khaokhouayensis</i> Servent & Francis, 2006 11. <i>H. armiger</i> (Hodgson, 1835) 12. <i>H. cf. turpis alongensis</i> Bourret, 1942 13. <i>H. cf. larvatus</i> (Horsfield, 1823) | <ol style="list-style-type: none"> 14. <i>Asellicus stoliczkanus</i> (Dobson, 1871) 15. <i>Coelops frithii</i> Blyth, 1848 <p>Vespertilionidae Gray, 1821</p> <ol style="list-style-type: none"> 16. <i>Myotis siligorensis</i> (Horsfield, 1855) 17. <i>M. muricola</i> Gray, 1846 18. <i>Scotophilus kuhli</i> Leach, 1821 19. <i>S. heathi</i> Horsfield, 1831 20. <i>Pipistrellus abramus</i> Temminck, 1840 21. <i>P. javanicus</i> (Gray, 1838) 22. <i>P. tenuis</i> (Temminck, 1840) 23. <i>Hypsugo pulveratus</i> (Peters, 1871) 24. <i>Murina cyclotis</i> Dobson, 1872 25. <i>M. tiensa</i> Csorba et al., 2007 26. <i>Harpiocephalus harpia</i> (Temminck, 1840) <p>Miniopteridae Hofer & Bussche, 2003</p> <ol style="list-style-type: none"> 27. <i>Miniopterus</i> cf. <i>fuliginosus</i> |
|--|---|

Previously, *H. khaokhouayensis* and *M. tiensa* were known only from their type localities. Significantly, *H. cf. turpis alongensis* is now reclassified as an endemic subspecies of Cat Ba. Its taxonomic is given in details in a scientific paper listed in Section 4.

Recent molecular studies indicated that the genus *Miniopterus* of Asia contains a range of cryptic species. Accordingly, all obtained materials belonging to this genus are just identified provisionally as *Miniopterus* cf. *fuliginosus*. A revision of the genus *Miniopterus* from Vietnam and other Southeast Asian countries is clearly required.

Results from echolocation studies suggested that *H. cf. larvatus* in Cat Ba would be a cryptic species. Intensive investigation into this species complex is needed to classify correctly the obtained materials.

2.3.2. Identification of key sites for bat conservation: three caves (namely Trung Trang, Gia Luan, Minh Chau) and May Bau forest are important homes to precious bat species within Cat Ba, including rare and endemic bat taxa of the area. Those caves attract domestic and foreign tourists, and have been exploited for tourism development.

2.3.3. Assessment of the main threats: exploitation of the bat caves for tourism development and habitat destruction for farming and industrial developments are



A mug produced by the project with attractive picture of “Cat Ba Leaf-nosed bat” and CLP logo

two main threats to bats of Cat Ba.

2.3.4. Raising the profile of bats and conservation recommendations:

- One international bat field workshop and one training workshop were organised with participation 68 people, including local rangers, authorities, school teachers, and others.
- A series of T-shirts, mugs, and posters were produced to distribute to local people and authorities for raising their understanding of bats.
- Six poster and oral presentations were given by the project members at national and international conferences. Information about the project and its outputs are also available on the most popular website of Vietnam (<http://vietnamnet.vn/khoahoc/trongnuoc/2006/10/628210/>) and other popular Vietnamese websites (such as: <http://tuoitre.vn/Chinh-tri-xa-hoi/Khoa-hoc-moi-truong/162258/Moi-dem-doi-an-bao-nhieu-con-muoi.html>; <http://tuoitre.vn/Chinh-tri-xa-hoi/Khoa-hoc-moi-truong/169949/Phat-hien-loai-doi-mui-xam-lon-o-VN.html>)



The local rangers, authorities, school teachers and other people participated in the training workshop on bat security and conservation co-hosted by CBLCP and CLP project

2.3.5. Initiation of the pride amongst local people in environmental protection:

- At the entrance to the Trung Trang Cave, local authorities have built nice signboards with attractive photos and messages for environmental protection.
- The managers of two other bat caves (Gia Luan and Minh Chau) have also understood the importance of bats to human and ecosystems. Consequently, they agreed with this project

leader in producing new signboards with bat live photos and messages for conservation education to place at the entrances to those caves.

- The Vietnamese name “**Đơi nếp mũi Cát Bà**” (= Cat Ba Leaf-nosed bat), which was given to *Hipposideros khaokhouayensis*, raised greatly the pride amongst local communities in bat conservation.

2.3.6. Local guides to the reserve's bats: preliminary reports with illustrated photos and key information for identification of bat species were distributed to local authorities after each of the ten field surveys. A manuscript of a handbook, namely “Đơi Cát Bà” (= Bats of Cat Ba), is being prepared and planned for submission to the Science and Technics Publishing House of Vietnam by May 2011 (after the expected date of confirmation of the new bat species *Hipposideros sp. nov.* in an international peer-reviewed journal).

2.3.7. Dissemination of the project results: A part from the reports distributed to local authorities, several parts of the project results were published in three papers in Vietnamese peer-reviewed journals, including the highest ranking journal of Vietnam in biology, namely “*Tap chi Sinh hoc*” (= Vietnamese Journal of Biology). In addition, the project results are already written as at least eight manuscripts for publications in international peer-reviewed journals (two are in press, two are submitted, and others follow).

Additionally, two websites (www.vietnamnature.com and www.vietnamnature.org) are under construction, scheduled for completion in May 2011, to post up all confirmed project findings.

2.4. ACHIEVEMENTS AND IMPACTS

- ❖ **Academic research enhancement:** All project members gained experience and skills from participation in the project programmes. Subsequently, they have specialised in bat research and conservation. One team member (Neil Furey) already obtained his PhD in 2009, and has become an international expert in bat biology and conservation. Four other project members (Vu Dinh Thong, Juliana Senawi, Chiao-Wen Chu, and Vuong Tan Tu) are also registered for their PhD degrees in bat research in world-famous universities. Ms Cao Thi Thanh Nga was already registered as an MSc student on environmental protection before she co-opted the CLP project. However, through participation in the projects programmes, she grew interested in bat research. She is looking for scholarship to register at a university for her PhD in bat research and conservation. Mr Pham Duc Tien has also spent almost full time for his bat research. Tien and Thong got invaluable opportunities to learn modern techniques for bat echolocation research from Prof. Hans-Ulrich Schnitzler and Dr Annette Senzinger of UT. Since then, they have conducted successfully other projects and obtained outstanding echolocation data.
- ❖ **Awareness raising and local community involvements in bat conservation:** Local people, including rangers and authorities, are familiar with bats and committed to protect important bat caves and habitats. They are proud of the endemic bat subspecies of Cat Ba and paid serious attention to conservation of its roosting sites. All three key bat caves are better protected for sustainable conservation managements. The project achievements are enduring since public communities have been involved in bat conservation.
- ❖ **Collaborative research links and enhancements:** The project members first met together when participated in the international bat field workshop in Cat Ba island in August 2006. Since then, they have been in close relationships. Without doubt, their experience learnt from that workshop and subsequent project programmes together with impressive relationships are sustainable efforts of the CLP project period. Consequently, the project members have established and enhanced national and international relationships for improving knowledge and skills. They have worked closely with colleagues of institutions in Vietnam and other countries, such as Harrison Institute, University of Tuebingen, University of Dublin, Aberdeen University, Hungarian Natural History Museum, Prince of Songkla University, National University of Laos, Texas Tech University, Royal University of Phnom Penh, Taipei Zoo, Chinese Academy of Sciences, Northeast Normal University, Guangzhou University, Fly By Night Bat Surveys, Biodiversity Institute of Ontario, and Yamaguchi University. We are happy to report here that relationships amongst our project members are very close, and expanded to external collaborative research links.

❖ **Conservation monitoring:** Relationships amongst project member, local rangers and authorities are close and strengthened. These have impacted greatly on bat conservation within the area.

❖ **Extension of the projects efforts:** The project members have greatly grown interested in bat research and conservation. Other bat research and conservation projects were undertaken successfully or being undertaken by the CLP project members. Pham Duc Tien has conducted successfully a bat research and conservation project in Con Dao island, south Vietnam (supported by the Malaysian Bat Conservation Research Unit), and Vuong Tan Tu is also undertaking a bat research and conservation project in Hanoi (sponsored by the Rufford Small Grant for Nature Conservation). Vu Dinh Thong is also conducting a research and conservation project in Hoang Lien National Park, northwest Vietnam (supported by Bat Conservation International).



Nguyen Xuan Hung of HNUS in a field survey

❖ **Capacity building:** Three students (Nguyen Xuan Hung, Ngo Khanh Phuong, and Pham Van The) of HUNS and one student (Lo Thai Lanh) of Tay Bac University were trained in bat taxonomy over the project period for completion of their BSc theses. They are university lecturers and school teachers, and have introduced bat biology into their students.

❖ **Dissemination of data:** At least eighteen scientific papers for publications in Vietnamese and international peer-reviewed journals have been written (entirely or partially based on the project results) – three have been published, one is in press, one has been submitted, others are planned for soon submission. A list of these papers is given in Section 4.

SECTION 3

3.1. CONCLUSION

The project results indicate that Cat Ba has a diverse bat fauna, including new, endemic and rare taxa. The project successfully raised the profile of bats with local people and conservation authorities through education materials and public media (newspaper, websites, and TV documentaries). As a result, three bat caves within the reserve (Trung Trang, Gia Luan, and Minh Chau) have received serious attentions from local officials in sustainable managements for ecotourism developments, and in environmental protection with emphases on bat conservation. The project provided great opportunities for its members from four countries (Vietnam, Ireland, Malaysia, and Taiwan) to establish and strengthen their relationships with colleagues from at least eleven other countries (United Kingdom, Germany, Hungary, Thailand, Lao PDR, Cambodia, Australia, United States of America, China, Canada, and Japan). The project members were well trained in bat taxonomy, echolocation and conservation biology. Since then, they have conducted successfully four other bat research and conservation projects in Vietnam. The project contributed data to four poster and three oral presentations at national, regional and international conferences. Confirmed results of the project were also introduced to students at Vietnamese and Chinese universities, and have been written in at least eighteen papers for scientific journals. CLP has a high profile within the project partners and relevant institutions.

3.2. LESSONS LEARNT AND PROBLEM ENCOUNTERED

3.2.1. Lessons learnt

- ◆ A judicious recognition of the project justification leads to the projects outstanding achievements. Cat Ba is a right site for the promotion of bat research and conservation. Various habitats of the area support a diverse bat fauna with rare and endemic taxa. Without exception, the local rangers, authorities, and public communities were enthusiastic, helpful, interested, and informed. They are all willing to help research and conserve the bat fauna and other biota.
- ◆ Academic researches benefit conservation activities. Results from taxonomic studies led to a proper determination of endemic and rare bat taxa, and partially raised the pride amongst local communities in bat conservation. Echolocation studies contributed valuable data to identification of key roosting sites and habitats of precious species.
- ◆ Open collaboration is vital to the project triumphs. Collaborations provided opportunities for the project members in:
 - Learning and improving research skills in bat taxonomy and echolocation;
 - Exchanging data and information to classify correctly obtained materials for determination of species diversity;
 - Producing conservation materials, newspaper articles, TV documentaries to raise the profile of bats with scientific and public communities;
 - Co-organising workshops and conservation research programmes;
 - Training students from universities;
 - Co-writing scientific papers for publications in Vietnamese and international journals.



TV documentaries produced by the project appeared in the Nature Explorer series of Thai television. CLP and the CLP logo was mentioned and acknowledged in the film.

3.2.2. Problem encountered

- ❖ No difficulty was encountered during the project period. However, tourism and industrial developments are increased greatly in the area. Current destruction of habitats at a range of sites within CBABR may threaten the bat fauna in coming time.

3.3. IN THE FUTURE

- ❖ Results of taxonomic and echolocation studies suggested that the bat fauna of CBABR may contains cryptic and undiscovered species. Further investigations into taxonomy, echolocation, and molecular systematics of bats of CBABR are clearly required.
- ❖ All most all other areas of Vietnam have received very little or no attention in bat research and conservation. It is quite promising that some undiscovered or cryptic species are living in those areas. On the other hand, education for bat conservation should also be given to the officials of those areas in coming time.

SECTION 4

4.1. APPENDICES

4.1.1 CLP identity

CLP becomes more familiar with the project partners and public communities. It is:

- ✓ acknowledged in all publications
- ✓ acknowledged and its logo is included in all presentations
- ✓ acknowledged and mentioned in all media products and conservation materials (TV documentaries, manuals, posters, and others).
- ✓ acknowledged and its logo is included in two being prepared websites (www.vietnamnature.com and www.vietnamnature.org), which are scheduled by May 2011.



T-shirt produced by the CLP project for promotion of bat conservation in Cat Ba

4.1.2. Reports and Publications

The following reports and publications have been produced by the project team, based partially or entirely on the CLP project results (names of the project members are formatted in **bold**):

4.1.2.1. Published papers

1. **Thong, V.D.**, N.T. Son, D.N. Loi, **P.D. Tien**. 2010. An overview of bat research in Bai Tu Long and Con Dao National Parks, with results from recent surveys. Vietnamese Journal of Biotechnology, 8(3A): 999–1005.
2. Son, N.T, **V.D. Thong**, N.X. Dang, G. Csorba. 2010. Conservation status and distribution ranges of some horseshoe and leaf-nosed bat species in Vietnam. Vietnamese Journal of Biotechnology, 8(3A): 981–990.

3. **Thong, V.D.**, N. T. Son, **P. D. Tien**, T. H. Hai, P. V. Nha. Current Status of Bats at Muong Do Area, Phu Yen District, Son La Province. Proceedings of the 3rd National Scientific Conference on Ecology and Biological Resources, Hanoi, Oct. 2009: 818–822.
4. **Thong, V.D.**, **N.M. Furey**. 2008. The bat fauna of Cat Ba Biosphere Reserve. Journal of Biology, 30(3): 73-77.
5. **Thong, V.D.**, C. Dietz, H.-U. Schnitzler, A. Denzinger, **N. Furey**, A. Borissenko, and P. J. J. Bates. 2008. First record of *Hipposideros khaokhouayensis* from Vietnam. Journal of Sciences, Hanoi National University of Sciences: 23-28.
1. **Thong, V. D.**, A. Denzinger, C. Dietz, H.-U. Schnitzler, and P. J. J. Bates. 2007. Intra- and Interspecific variation in morphology and echolocation in *Hipposideros larvatus* species complex in Vietnam. Bat Research News, 48(3): 128.
6. **Thong, V.D.**, **V.T. Tu**, **P.D. Tien**, **C-W. Chu**, **J. Senawi**, P. Bates, **N. Furey**. 2007. Echolocation call frequency of Marshall's Horseshoe Bat *Rhinolophus marshalli* from Cat Ba National Park and its current status in Vietnam. Proceedings of the 2nd National Scientific Conference on Ecology and Biological Resources, IEBR, Hanoi: 274-277.
7. **Tien, P.D.**, **V.D. Thong**, L.V. Khoi, T.T. Loan, N.T. Hien, H.V. Cu. 2007. The known bat species of Yok Don National Park and current status of Tail-less fruit bat *Megaerops niphanae* in Vietnam. Proceedings of National Conference in Life Science. Science and Technique Publishing House: 199-201.
8. La, T.V., N.V. Sang, **P.D. Tien**, T.V. Cuong, and **V.D. Thong**. 2007. Diversity of vertebrates (Mammals, Birds, Amphibians, and Reptiles) in the Tam Tao mountain region, Cho Don district, Bac Kan province. Proceedings of National Conference in Life Science. Science and Technique Publishing House: 85-88.
9. Khoi, L.V., N.X. Hung, **V.D. Thong**, **N. Furey**. 2007. Diversity of bats in Ba Be National Park, Bac Kan province. Proceedings of National Conference in Life Science. Science and Technique Publishing House: 73-76.

4.1.2.2. Papers in press

1. Yu, W., and **V.D. Thong**. A new species of *Rhinolophus* from China with supplemental data from Vietnam. Zoological Science.
2. **Thong, V.D.**, C. Dietz, A. Denzinger, P.J.J. Bates, **N.M. Furey**, G. Csorba, G. Hoye, L.D. Thuy, and H.-U. Schnitzler. Further records of *Murina tiensa* from Vietnam with first information on its echolocation calls. Hystrix-Italian Journal of Mammalogy.

4.1.2.3. Abstract of presentations given at conferences

1. **Thong, V.D.**, C. Dietz, A. Denzinger, P.J.J. Bates, H.-U. Schnitzler. 2009. Rhinolophoid Bats of Vietnam: Taxonomy, Echolocation, and Conservation (Megadermatidae, Rhinolophidae, and Hipposideridae). Book of Abstracts, the XXIII Annual Meeting of the Society for Conservation Biology (SCB2009), Beijing, China.
2. **Tien, P. D.**, H.-U. Schnitzler, A. Denzinger, P. J. J. Bates, N. M. Furey, **V. D. Thong**. 2009. The bat fauna of Cat Ba Biosphere Reserve, North Vietnam. Book of



A poster presentation at the Annual Meeting of the Society for Conservation Biology (SCB2009) in Beijing. CLP was acknowledged and its logo included.

Abstracts, the XXIII Annual Meeting of the Society for Conservation Biology (SCB2009), Beijing, China.

4.1.2.4. Manuscript ready to submit

1. **Thong, V.D.**, S.J. Puechmaille, A. Denzinger, P.J.J. Bates, C. Dietz, G. Csorba, P. Soisook, E.C. Teeling, S. Matsumura, **N.M. Furey**, and Hans-Ulrich Schnitzler. Systematics and echolocation of a Widespread Bat Species complex (Chiroptera: Hipposideridae: *Hipposideros*), with a description of a new subspecies from Vietnam.
2. **Thong, V. D.**, P. J. J. Bates, G. Csorba, A. Denginger, C. Dietz, and H.-U. Schnitzler. A new *Hipposideros* species from Vietnam.
3. **Thong, V.D.**, Sebastien J. Puechmaille, Keping Sun, Christian Dietz, Annette Denzinger, Gabor Csorba, Paul J.J. Bates, Hans-Ulrich Schnitzler. Taxonomy and Echolocation of the *Rhinolophus* “*pusillus*-group” from China and Vietnam, with Significant Remarks on the Systematic Position of *R. lepidus* Blyth, 1844.

4.1.2.5. Papers in preparation

1. **Thong, V. D.**, A. Denzinger, C. Dietz, P. J. J. Bates, and H.-U. Schnitzler. Echolocation calls of rhinolophoid bats (Rhinolophidae, Hipposideridae, and Megadermatidae) of Vietnam.
2. **Thong, V. D.**, A. Denzinger, C. Dietz, P. J. J. Bates, and H.-U. Schnitzler. Taxonomy of rhinolophoid bats (Rhinolophidae, Hipposideridae, and Megadermatidae) of Vietnam with geographical variations in body size and echolocation frequencies.

4.2. BIBLIOGRAPHY

- Bates P.J.J., Harrison D.L. 1997. Bats of the Indian Subcontinent. Harrison Zoological Museum Publications: 258 pp.
- Borissenko A.V., Kruskop S.V. 2003. Bats of Vietnam and Adjacent Territories: an identification manual. Moscow: 212 pp.
- Bourret R. 1942. Sur quelques petits Mammifères du Tokin et du Laos. C. R. Conseil Rech. Sci. Indochine, 2e semestre: 27–30.
- Csorba G., Ujhelyi P., Thomas N. 2003. Horseshoe Bats of the World (Chiroptera: Rhinolophidae). Alana Books: 160 pp.
- Furey, N. (2002) Fauna In Cat Ba National Park: Biodiversity Survey 1999. pp. 18-30. Frontier Vietnam Environmental Research Report 20. Society for Environmental Exploration, UK and Institute of Ecology and Biological Resources, Hanoi.
- Topál G. 1993. Taxonomic status of *Hipposideros larvatus alongensis* Bourret, 1942 and the occurrence of *H. turpis* Bangs, 1901 in Vietnam (Mammalia, Chiroptera). Act. Zool. Hung. 39: 267–288.

4.3. ADDRESS LIST AND WEB LINKS

- ◆ Harrison Institute, Bowerwood House, 15 St Botolph’s Road, Sevenoaks, Kent, TN13 3AQ, United Kingdom; <http://www.harrison-institute.org/>
- ◆ Institute of Ecology and Biological Resources, 18 Hoang Quoc Viet Road, Cau Giay District, Hanoi, Vietnam; <http://www.iebr.ac.vn/>
- ◆ Two other websites to post up the project results are under construction (www.vietnamnature.com and www.vietnamnature.org).

4.4. DISTRIBUTION LIST

This final report is distributed to the Institute of Ecology and Biological Resources (contact details as above). It is also planned to distribute to the following institutions:

- Cat Ba National Park, Cat Hai District, Hai Phong province, north Vietnam
- Conservation International – Office in Hanoi, Vietnam
- BirdLife International - Vietnam Programme, Hanoi, Vietnam
- Hanoi University of Science, Hanoi, Vietnam

The project team is also willing to distribute this report to any another institution recommended by CLP.