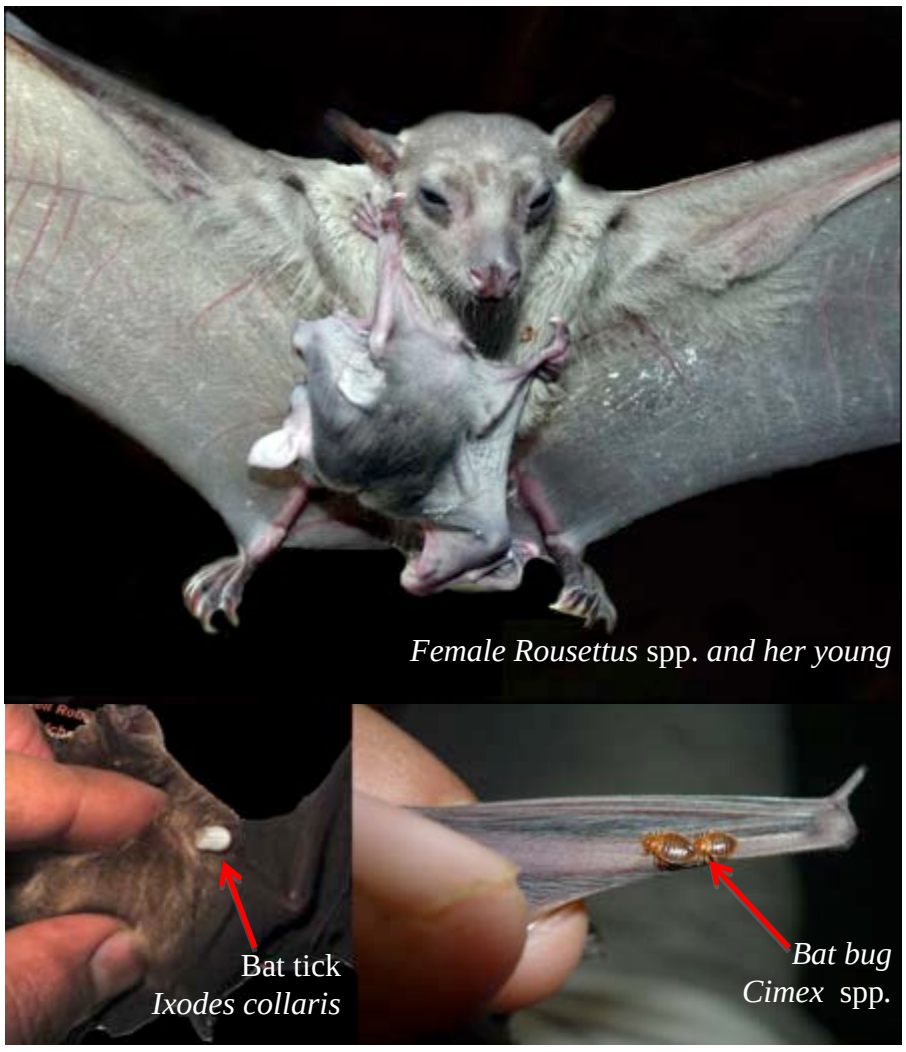
RGS 18889-B: Final Report

BATS AND THEIR PATHOGENS IN URBAN AND SURROUNDING AREAS OF VIETNAM: IMPLICATIONS FOR CONSERVATION AND FOR PREVENTION OF EMERGENCE OF BAT-BORNE ZOONOTIC DISEASES



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Under the framework of the project, during the period from February 2017 to the end of July 2018, the project team has carried out a series of project activities. While additional field and laboratory investigations and qualitative analysis of data derived from up-to-date studies are far from the completion, this final report consequently presents the results of surveys and activities undertaken between February 2017 and August 2018 as follows:

1. Conservation research

During the project period, research team and some local collaborators (i.e. Wildlife At Risk, GreenViet,...) have carried out a series of field expeditions in different sites in the three regions of countries i.e. northern (Hanoi city, Thanh Hoa, Vinh Phuc, Ha Giang and Cao Bang province); central (Da Nang city, Ninh Thuan and Binh Thuan provinces); and southern (Ho Chi Minh city, Dak Nong and An Giang provinces). The surveyed areas comprised different habitats along a gradient from city central, rural and forested areas.

In the field, bats were captured by using mist-nets and harptraps. Captured bats were carefully handled, photographed, and recorded their calls. Most of captured bats were released after taking necessary information. We also collected only some bats as vouchers (i.e. bats found dead or individuals of potential unknown species) for future investigations. Based on the guideline of FAO (2011), we applied non-lethal methods i.e. biopsy punching, anus swapping when collecting tissues and samples for analysing bat-borne pathogens from captured bats.

Accordingly, were captured a total of 739 bats of more than 50 species accounting more than 40% of Vietnamese bat diversity. Most of those were released into the wild after recording required data for their species identification and other biological assessment (such as sex, age, reproductive phenomenon).

From captured bats, we have collected a total of 685 tissues / faecal samples for phylogenetic and virological investigations of bats and their pathogens; 220 ecto-parasites; 155 blood spots for malaria screening; and 125 samples for diet analyses of selected species. Of which, a number of collected materials have been being analysed for phylogenetic and virological investigations of bats and their pathogens in different laboratories by either project members and collaborators as follow:

- The BSL-4 Virological Laboratory, Szentagothai Research Centre, University of Pécs, Hungary: **204 samples.**
- Infectious Disease Surveillance Center, National Institute of Infectious Diseases: **394 samples.**
- Department of Parasitology and Zoology, University of Veterinary Medicine, Budapest, Hungary: **140 samples / species of ecto-parasites (ticks, bat flies and mites)**

2. Capacity building program

During the first year, the project has recruited 01 pre-PhD student, 2 MSc and 01 BSc students. These assistants have learnt a lot of experiences in field/lab work, networking, etc. which might be useful for their future carriers.

- Chu Thi Hang, MSc, a pre-PhD student: Hang has joined the project as an assistant. She has focused on "the application species niche modelling for bats and other small mammals in Vietnam" for her PhD study.
- Nguyen Van Thang, MSc student: Thang has enrolled a MSc course in the University of Da Nang University of Education. He is conducting a study of bat

diversity in different localities within Da Nang province for his MSc thesis (the title is not fixed).

- Pham Van Phu, MSc student at the Faculty of Environmental Science of Hanoi University of Science (HUS). As a junior entomologist, Phu has assisted the project team in diet analyses of selected bat species.
- -Nguyen Ha Ngoc Hien, a graduating student of the project. She defended her BSc entitled "Assessment of the species diversity of bats (Mammalia, Chiroptera) in the Huong Son special-use forest, My Duc district, Hanoi" at Hanoi University of Education in May 2018

The above results ensure that the impact of the projects capacity-building works will continue and certainly some new bat projects will be developed to improve national bat conservation and management.

Hien is inspecting a bat in the field

Hang, Thang & Phu (from left to right) are setting a harptrap in the field

3. Enhancement of local awareness on bat conservation

During the past period, project team has established some “Bat party” events for local resident, particularly children to strengthen their awareness on bat conservation and environment management.

Showing a live bat to local children by Vuong Tan Tu

The project team also collaborated with local organizations (i.e GreenViet) to established seminars and workshops on "Urban bats and bat borne diseases".

Workshop on "Urban bats and bat borne diseases" held in April 2017 at the University of Da Nang - University of Education (co-organised with GreenViet)

4. Publication

Some academic papers developed from results of this project were published in international journals (Rufford Foundation was cited as sponsor for all of these paper).

1. Tu, V.T., Hassanin, A., Görföl, T., Arai, S., Fukui, D., Thanh, H.T., Son, N.T., Furey, N.M., and Csorba, G. (2017). Integrative taxonomy of the *Rhinolophus macrotis* complex (Chiroptera, Rhinolophidae) in Vietnam and nearby regions. J Zool Syst Evol Res *55*, 177–198.

ORIGINAL ARTICLE

WILEY

Integrative taxonomy of the *Rhinolophus macrotis* complex (Chiroptera, Rhinolophidae) in Vietnam and nearby regions

Vuong Tan Tu[1,2,3] | Alexandre Hassanin[2,3] | Tamás Görföl[4] | Satoru Arai[5] | Dai Fukui[6] | Hoang Trung Thanh[7] | Nguyen Truong Son[1] | Neil M. Furey[8] | Gábor Csorba[4]

2. Hornok, S., Szőke, K., Boldogh, S.A., Sándor, A.D., Kontschán, J., Tu, V.T., Halajian, A., Takács, N., Görföl, T., and Estók, P. (2017). Phylogenetic analyses of bat-associated bugs (Hemiptera: Cimicidae: Cimicinae and Cacodminae) indicate two new species close to *Cimex lectularius*. Parasites Vectors 10, 439.

Hornok et al. Parasites & Vectors (2017) 10:439
DOI 10.1186/s13071-017-2376-1

Parasites & Vectors

RESEARCH Open Access

Phylogenetic analyses of bat-associated bugs (Hemiptera: Cimicidae: Cimicinae and Cacodminae) indicate two new species close to *Cimex lectularius*

Sándor Hornok[1*], Krisztina Szőke[1], Sándor A. Boldogh[2], Attila D. Sándor[3], Jenő Kontschán[4], Vuong Tan Tu[5], Ali Halajian[6], Nóra Takács[1], Tamás Görföl[7] and Péter Estók[8]

3. Kemenesi, G., Kurucz, K., Zana, B., Tu, V.T., Görföl, T., Estók, P., Földes, F., Sztancsik, K., Urbán, P., Fehér, E., et al. (2017). Highly divergent cyclo-like virus in a great roundleaf bat (Hipposideros armiger) in Vietnam. Arch Virol 162, 2403–2407.

Arch Virol
DOI 10.1007/s00705-017-3377-2

BRIEF REPORT

Highly divergent cyclo-like virus in a great roundleaf bat (*Hipposideros armiger*) in Vietnam

Gábor Kemenesi[1,2] · Kornélia Kurucz[1] · Brigitta Zana[1,2] · Vuong Tan Tu[3] · Tamás Görföl[4] · Péter Estók[5] · Fanni Földes[1,2] · Katalin Sztancsik[1,2] · Péter Urbán[6,7] · Enikö Fehér[8] · Ferenc Jakab[1,2]

4. Thong, V.D., Mao, X., Csorba, G., Bates, P., Ruedi, M., Viet, N.V., Loi, D.N., Nha, P.V., Chachula, O., Tuan, T.A., et al. (2018). First Records of Myotis altarium (Chiroptera: Vespertilionidae) from India and Vietnam. Mammal Study 43, 1–7.

Mammal Study 43: 67–73 (2018) DOI: 10.3106/ms2017-0076

Short communication

First records of *Myotis altarium* (Chiroptera: Vespertilionidae) from India and Vietnam

Vu Dinh Thong[1,2,*], Xiuguang Mao[3], Gábor Csorba[4], Paul Bates[5], Manuel Ruedi[6], Nguyen Van Viet[7], Dao Nhan Loi[8], Pham Van Nha[8], Oana Chachula[9], Tran Anh Tuan[1], Nguyen Truong Son[1,2], Dai Fukui[10], Vuong Tan Tu[1] and Uttam Saikia[11]

5. Tu, V.T., Hassanin, A., Furey, N.M., Son, N.T., and Csorba, G. (2018). Four species in one: multigene analyses reveal phylogenetic patterns within Hardwicke's woolly bat, *Kerivoula hardwickii*-complex (Chiroptera, Vespertilionidae) in Asia. Hystrix It. J. Mamm.

6. Tu, VT., Hang, C.T., Son, N.T. (2018) Conservation of Natural and Cultural Heritage in the Huong Son complex of Natural Beauty and Historical Monuments, Northern Vietnam. Journal of World Heritage Studies, special issue - Sacred Landscapes. (in press).

It should be noted that 04 other manuscripts using data generated from this project have been being finalized or already submitted into international journals. Due to confidentiality reasons, we will send these papers to RGSF after their publication. In addition, since laboratory investigations of samples/specimens collected during the project are still continuing, some other academic manuscripts will be developed in the future. Rufford Foundation have been being cited in these publications.

Conference presentation and media article:
Vuong Tan Tu, Chu Thi Hang, and Nguyen Truong Son "Conservation of Natural and cultural heritage in the Huong Son Complex of Natural Beauty and Historical Monuments, Northern Vietnam: a case study with bats" (Oral presentation), Capacity Building Workshop and Symposium on Nature-Culture Linkages in Heritage Conservation in Asia and the Pacific 2017 (CBWNCL), University of Tsukuba, Japan, September 2017.

Vuong Tan Tu (PI) (marked as X) attended the CBWNCL 2017

Tu V.T., Furey N.M, Csorba G., Gorfol T., Koyabu D., Son N.T. and Hang C.T. "Human-bat interactions at sacred sites in Vietnam" (Oral presentation). The 4th Southeast Asian Bat Conference (SEABCO), Bacolod, Phillipines, 06-09 August, 2018.

Vuong Tan Tu (PI) presented at the SEABCO, Bacolod, Philippines, 06-09 August, 2018

Vuong Tan Tu and Chu Thi Hang, (2017). Records of bat fatalities due to hyper thermal during hottest days in the summer 2017 in northern Vietnam. Press released in the website of Vietnam Academy of Science and Technology. http://www.vast.ac.vn/tin-tuc-su-kien/tin-khoa-hoc/trong-nuoc/2982-ghi-nhan-hien-tuong-doi-chet-do-nang-nong-o-mot-so-do-thi-o-mien-bac)

BSc thesis and awareness raising materials:

BSc thesis – N.H.N Hien

Poster - Calendar 2018

Stickers for kids

Some selected bats were captured during the field surveys of the project

A pregnant *Rousettus* sp.

Cynopterus sphinx

Chaerephon plicatus

Taphozous melanopogon

Megaderma lyra

Coelops frithii

Hipposideros larvatus

Hipposideros galeritus

Rhinolophus pearsonii

Murina wastoni

Kerivoula picta

Scotomanes ornatus