

Bats and Viruses in Western Asia: A Model for One Health Surveillance using Research Networks

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Introduction

- Bats are **extremely diverse** (1,300+ species globally), **highly mobile**, and **ecologically and economically important** wildlife
- Bats **host viral zoonoses** (e.g. Marburg virus, Nipah virus, SARS-CoV), but knowledge of bat-associated viruses is limited in some parts of the world

- Bat research networks** exist in most regions of the world (Fig 1), including Southeast Asia (Southeast Asian Bat Conservation Research Unit, SEABCRU), Latin America (RELCOM), Europe (Eurobats), and Africa (Bat Conservation Africa)

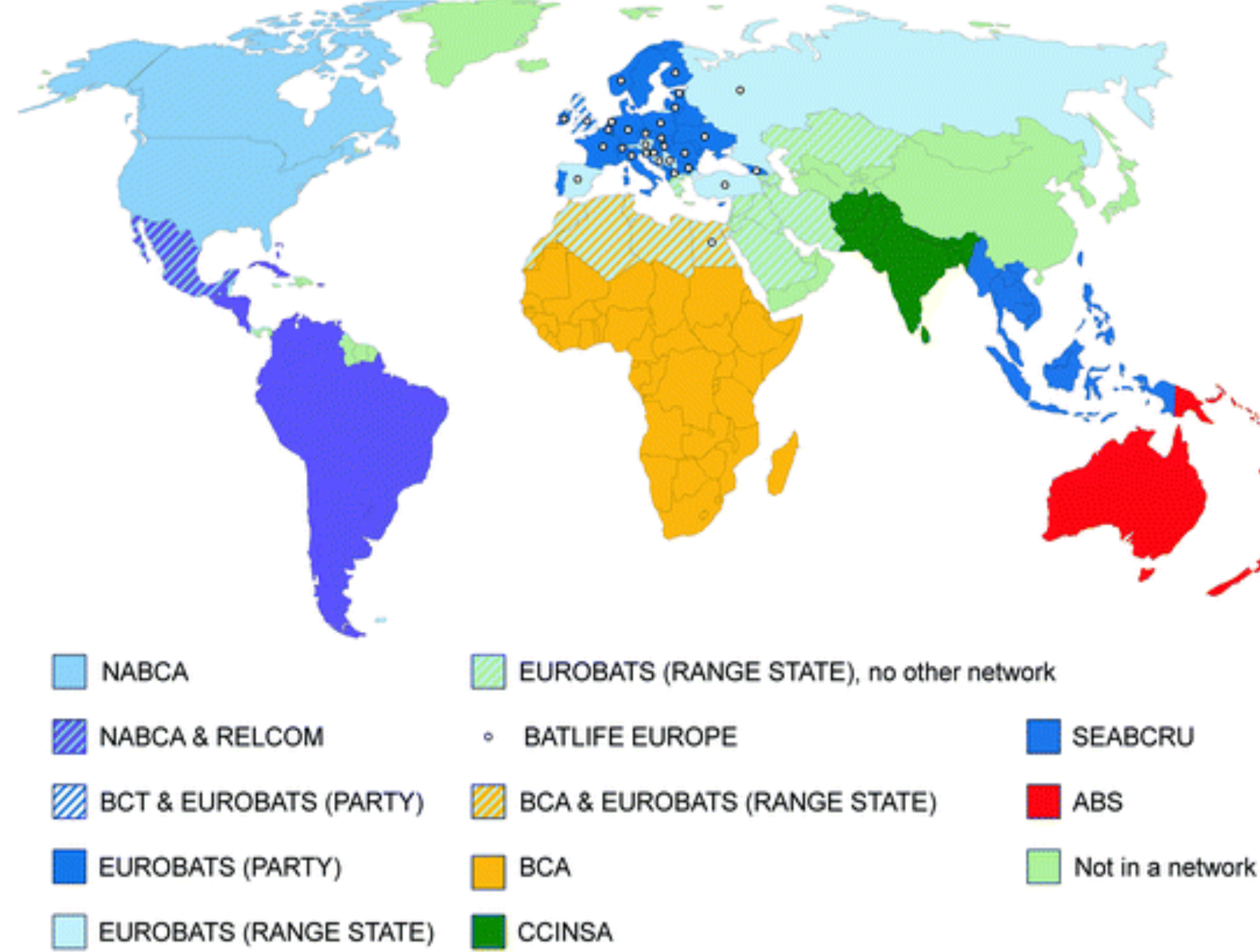


Figure 1. Existing bat research networks, Kingston et al. (2015) doi: 10.1007/978-3-319-25220-9_17

- However, current **bat research in the Middle East and Western Asia is highly fragmented and largely undeveloped**

- To fill the research gap in Western Asia, **EcoHealth Alliance** launched a **new collaborative One Health research project** that leverages regional expertise to characterize bat and coronavirus (CoV) diversity and potential bat-human interfaces to assess the risk of bat-associated disease emergence

- This project aims to **support local biosurveillance capacity** in partner countries and identify **win-win solutions to promote bat conservation and safeguard human and wildlife health** in a politically volatile region

We have achieved the following since the project's inception (Oct 2017):

- Inaugural WAB-Net workshop** was held on September 17-20, 2018 in Tbilisi, Georgia with **40 participants from 11 countries** in Western Asia (Fig 4)
- Identified key personnel and sampling sites** in high- and medium-engagement countries
- Standardized field and lab protocols** to ensure region-wide consistency in CoV sampling and screening methods



Figure 4. Participants at 2018 WAB-Net workshop

- Sampled 270 bats (of 9 species) in three high-engagement countries:** 90 individual bats in Turkey (Aug), Georgia (Sept), and Jordan (Oct) (Fig 5)



Figure 5. Non-lethal sampling of bats

Species (no. sampled/country)	Turkey	Georgia	Jordan
<i>Miniopterus schreibersii</i>	30	78	0
<i>Myotis capaccinii</i>	15	0	0
<i>Myotis blythii</i>	0	8	0
<i>Rhinolophus blasii</i>	17	1	0
<i>Rhinolophus euryale</i>	27	2	0
<i>Rhinolophus ferrumequinum</i>	1	1	0
<i>Rhinopoma cystops</i>	0	0	2
<i>Rhinopoma microphyllum</i>	0	0	60
<i>Rousettus aegyptiacus</i>	0	0	28

Methods

Objective 1: Characterize bat and bat-associated CoVs in Western Asia to assess risk of disease emergence

- Capture and non-lethally sample **5,000 bats** in 5-year period (2018-2023)
- Collect **20,000 samples (i.e. oral, rectal swabs and/or feces, and blood)** (Fig 2) and screen for CoVs using consensus PCR at regional labs in Georgia and Jordan



Figure 2. Collecting saliva samples from *Miniopterus schreibersii* in Turkey using a miniature cotton swab, then sample is placed in vials with transport media and stored in ultra-cold cryshipper

- Record **morphological and demographic traits** (e.g., species, age, sex, reproductive status, body condition) of sampled bats
- Assess **environmental and human disturbance data** to identify interactions between humans and bats at sampled sites
- Data will be used to **estimate the risk of regional disease emergence** by:

- identifying correlates of CoV diversity and distribution** (e.g., host diversity or traits, site conditions)
- characterizing interactions between humans and bats** (e.g., cave tourism, guano collection, hunting)

Objective 2: Establish the Western Asia Bat Research Network (WAB-Net) to foster regional collaboration

- A **regional One Health initiative** to connect bat researchers and virologists with public health experts in **> 12 countries** (Fig 3)



Figure 3. WAB-Net participant countries. High-engagement countries, with more intensive sampling efforts, represent biogeographic 'gateways' for bat and bat-associated pathogen dispersal

- Strengthen diagnostic capabilities** for early detection, and **promote collaborations** in zoonotic disease research



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- Host **annual workshops**, in-service **training opportunities**, and **One Health research exchanges** to provide field-to-lab training in disease surveillance to WAB-Net members

Expected Outcomes

Through our recently established project (WAB-Net), we strive to **accomplish the following outcomes:**

- Development of a **relational database** to collate and share project data: <https://wabnet.eha.io>
- Improve understanding of the **distribution and abundance of bat species and their associated viruses** in Western Asia
- Promote awareness** of both bat conservation and zoonotic disease spillover risk, and provide **hands-on capacity building workshops** (Fig 6)

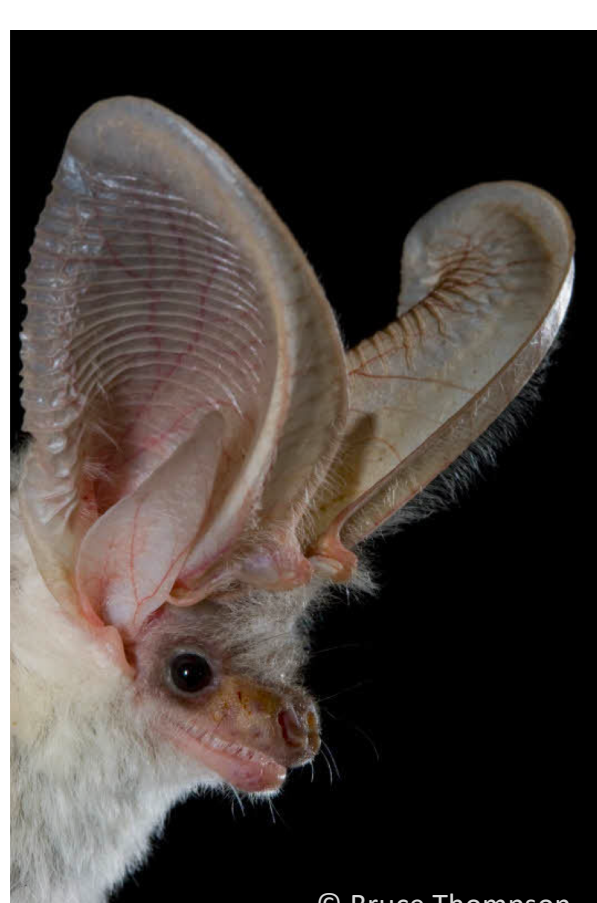
- Foster scientific collaboration** among bat biologists, public health specialists, and virologists across Western Asia

- Leverage regional expertise** to strengthen One Health research to more rapidly detect, diagnose, and respond to emerging infectious diseases

- Integrate host ecology and disease surveillance to find **win-win solutions that promote bat conservation and safeguard public and wildlife health** in a politically volatile region



Rhinolophus mehelyi, IUCN-designated vulnerable species



Plecotus christii, data deficient species lacking basic ecology & distribution data



Figure 6. Hands-on training in non-lethal capture and sampling protocols



"Bats for Peace" mission

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