

# ARE BATS SPECIAL AS CONSERVATION TARGETS

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# WHAT SPECIAL FEATURES OF BATS HAVE IMPLICATIONS FOR THEIR CONSERVATION?

- FLIGHT
- ECHOLOCATION
- HETEROTHERMY
- ROOSTING AGGREGATIONS
- SYNANTHROPY

- **SYNANTHROPES: ANIMALS WHICH LIVE NEAR AND BENEFIT FROM HUMANS AND THEIR DWELLINGS**

# FLIGHT

- DAILY CYCLE ELEVATES METABOLISM AND Tb ANALOGOUS TO FEVER RESPONSE OF OTHER MAMMALS: SELECTION PRESSURE FOR COEXISTENCE WITH VIRUSES O'SHEA et al., 2014
- BUT FEW RECORDED INSTANCES OF MORTALITY EVENTS FROM VIRUSES: RABIES, LLOVIU O'SHEA et al., 2016
- SO THE IMMUNE SYSTEM OF BATS MAY HAVE EVOLVED TO COPE WITH VIRUSES

# FLIGHT AND ECHOLOCATION

- ENABLE BATS TO FLY IN A WIDE RANGE OF FORAGING HABITATS – OPEN, EDGES, INSIDE CLUTTER
- TO WHAT EXTENT CAN ECHOLOCATING BATS ADAPT TO CHANGES IN FORAGING HABITATS?
- PLASTICITY: *PIPISTRELLUS* SPP: KALKO & SCHNITZLER, 1993. *MORMOPTERUS MINUTUS*: MORA ET AL., 2011. *MYOTIS MACRODACTYLUS*: LUO ET AL., 2012. *NOCTILIO LEPORINUS* : UBERNICKEL ET AL., 2013.
- SOME SPECIES ‘FOREST-DEPENDENT’
- WHAT HAPPENS WHEN THE FORESTS DISAPPEAR?
- GLEANING VS HAWKING  
FAURE & BARCLAY 1994: *MYOTIS EVOTIS*

# FLIGHT & ECHOLOCATION

- WHEN GAPS CREATED IN FORESTS – EDGE SPECIES & OPEN SPACE FORAGERS MOVE IN
- WHEN FORESTS CLEAR FELLED - FOREST SPECIALISTS AVOID OPEN HABITATS
- FM/CF BATS (EDGE/OPEN SPACE) CAN STILL PRODUCE FM CALLS – BUT FM ( FOREST) BATS LESS ABLE TO PRODUCE BROADBAND CALLS
- FOREST BATS: LOW WING-LOADING/LOW ASPECT RATIO – RISK FACTOR

# URBAN BATS

- URBANISATION - VERY RECENT IN THE EVOLUTIONARY HISTORY OF BATS
- SOME FAMILIES (EG MOLOSSIDS) BETTER PREADAPTED THAN OTHERS (EG RHINOLOPHIDS) - KUNG & THRELFALL, 2016
- SOME INDIVIDUAL SPECIES SUCCESSFULLY URBANISE, OTHERS DO NOT
- OPEN SPACE FORAGERS DO BETTER

# HETEROOTHERMY

- BATS CAN BECOME TORPID IN RESPONSE TO LOW  $T_a$  AND FOOD SHORTAGE
- TORPOR AFFECTS TIMING OF REPRODUCTION: OVULATION, SPERMATOGENESIS AND RATE OF FETAL GROWTH/MILK PRODUCTION
- VARIABLE GESTATION PERIOD UNIQUE TO BATS
- HIGH  $T_b$  NOT COMPATIBLE WITH SPERM STORAGE

# ROOSTING AGGREGATIONS

- 20<sup>TH</sup> CENTURY:  
30M *PTEROPUS* IN CAMP 10KM X 1.3KM  
20M *TADARIDA* IN CAVES
- TODAY: 8M EIDOLON AT KASANKA, ZAMBIA

# ROOSTING AGGREGATIONS

- ADVANTAGES:  
CLUSTERING SAVES ENERGY  
NUMBERS CONFUSE PREDATORS, EXCEPT  
MAN
- DISADVANTAGES:  
DISEASE TRANSMISSION (WNS)  
MAKES HUNTING EASIER

# SYNANTHROPY

- NO OTHER VERTEBRATE GROUP SO SYNANTHROPIC
- MORE PRONOUNCED IN TEMPERATE ZONE
- WHY?
- LOW THERMAL CONDUCTIVITY OF WOOD
- BATS FOLLOWED THE WOOD INTO BUILDINGS

# ARE BATS SPECIAL AS CONSERVATION TARGETS?

- TARGET? SOMETHING TO AIM FOR **WITH AN EXPECTATION OF HITTING**
- UNEP/CBD: AICHI BIODIVERSITY TARGETS  
#5: “BY 2020, THE RATE OF LOSS OF ALL NATURAL HABITATS, INCLUDING FORESTS, IS AT LEAST HALVED AND WHERE FEASIBLE, BROUGHT CLOSE TO ZERO AND DEGRADATION AND FRAGMENTATION IS SIGNIFICANTLY REDUCED
- KOREA 2016: NOT ON COURSE TO MEET AICHI TARGETS.....

# TARGETS

- BIODIVERSITY ACTION PLANS:  
'.....RESTORE POPULATIONS TO PRE 19XX LEVELS'
- ACHIEVE 'FAVOURABLE CONSERVATION STATUS' .....NOT SPECIFIC
- RECOVERY CURVES MAY BE A WAY OF MEASURING CONSERVATION SUCCESS

# FLIGHT - TARGETS

- FLIGHT: COLLISIONS WITH WIND TURBINES
- TARGETS:
  - 1.SITE WIND FARMS AWAY FROM FLIGHT PATHS AND MIGRATORY ROUTES
  - 2.TURN OFF OR FEATHER BLADES ROTATING AT <6M/SEC
  - 3.TURN OFF AT NIGHT APRIL-OCTOBER, PARTICULARLY AT DAWN AND DUSK
- VOLUNTARY OR STATUTORY

# FLIGHT & ECHOLOCATION

- 'FOREST DEPENDENT' SPECIES:

*TRIAENOPS RUFUS*

*MYOTIS GOUDOTI*

*M.BECHSTEINI*

*M.SEPTENTRIONALIS*

MADAGASCAR

EUROPE

NORTH AMERICA

- BATS DECLINE IN RESPONSE TO FOREST LOSS

KINGSTON (2013) MEYER ET AL.,(2016) LAW ET AL., (2016)

# AICHI TARGETS

- TARGET 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.
- TARGET 7: By 2020 areas under agriculture, aquaculture and **forestry** are **managed sustainably**, ensuring conservation of biodiversity.
- SUSTAINABLE FORESTRY – BAT BIODIVERSITY RETURNS  
CLARKE ET AL.,2005 a,b FOR TRINIDAD

# CLIMATE CHANGE

- EFFECTS OF CLIMATE CHANGE MODELLED
- HETEROTHERMY CONFERS ADAPTABILITY
- *PIPISTRELLUS KUHLII* : NORTHWARDS IN EUROPE  
(*P.NATHUSII* : WESTWARDS)
- BATS MOVE TO HIGHER ALTITUDES (COSTA RICA)
- DROUGHT IN AUSTRALIA: PUP DEATHS IN  
*M.SCHREIBERSII*
- TEMPERATURE EXTREMES (HIGH  $T_a$ ):  
30,000 *PTEROPUS* DEATHS DURING 19 EVENTS  
WELLBERGEN ET AL.,2008

NEW SOUTH WALES – FEBRUARY 2017- 46°C  
*PTEROPUS POLIOCEPHALUS*



# CLIMATE CHANGE

- CYCLONES: MAY DECREASE IN FREQUENCY BUT INCREASE IN INTENSITY
  - HALVED POPULATION OF *P.RODRICENSIS* IN MASCARENE ISLANDS  
CARROLL, 1988
  - REDUCED POPULATION OF *P.SAMOENSIS* BY 90%  
CRAIG ET AL.,1994

# CLIMATE CHANGE TARGET

- INCREASE LANDSCAPE CONNECTIVITY  
‘We present **measures that could be implemented immediately** to mitigate future climate change impacts’ Aguiar et al., 2015  
for the Brazilian Cerrado  
but bats will compete with soybean, coffee  
and sugarcane.....

# ROOSTING AGGREGATIONS

- **PROTECTION & MANAGEMENT:**  
ABOVE GROUND eg NATIONAL PARKS: KASANKA, ZAMBIA; SAMOA  
BELOW GROUND: CARLSBAD, NM; BRACKEN CAVE, TX; MORAVIAN KARST
- **MAN-MADE HIBERNACULA:**  
MAYENER GRUBENFELD - RHINELAND PFALZ-  
PURCHASED BY NABU (NGO): 30-100,000 BATS  
NIETOPEREK – W.POLAND – NATURA 2000 IN  
2005: ca.45,000 BATS

# GATING UNDERGROUND HIBERNACULA

- SOME+VE, SOME –VE
- MANAGEMENT  
PREFERABLE  
(ELECTRONIC  
SURVEILLANCE?)



# SYNANTHROPY: MANAGE ROOSTS IN BUILDINGS



## EUROBATS



## EUROBATS

Publication Series  
No.

# 4

Achieving and maintaining favourable conservation status for bats requires that their breeding and resting sites – roosts – are protected. In Europe, a high percentage of bat species roost for at least part of each year in buildings. Buildings of cultural heritage importance (e.g. churches, castles, bridges) are often of particular importance for bats. These structures may be protected in their own right leading to conflict between building conservation work and bat conservation.

To examine this issue EUROBATS established a working group to gather information on bat species roosting in overground buildings; the types of roosts used; and the methods employed to protect these roosts, particularly those in buildings of cultural heritage importance.

A questionnaire addressing these topics was circulated to all range states and responses were received from 50 experts from 37 countries. This publication summarises those responses. It also provides practical advice, illustrated by case studies, on ways in which the potential conflicts between the protection of bats and the conservation of heritage buildings can be managed.

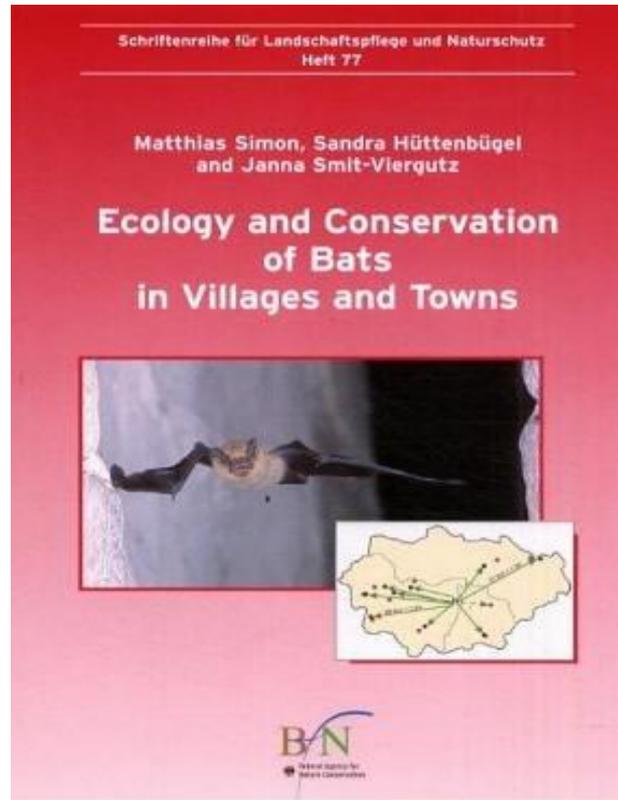


### Protection of overground roosts for bats

ISBN 978-92-95058-17-0  
(printed version)

ISBN 978-92-95058-18-7  
(electronic version)

Ferdia Marnell • Primož Presetnik



- Subtitle ‘Creating a network of roost sites for bat species inhabiting human settlements’ – in Marburg-Biedenkopf district pp261.

# INSULATING OLDER HOUSING

- LOVOSICE, CZECH REPUBLIC



# BATS IN CHURCHES

AN ENGLISH PROBLEM.....?

£3.8m grant to partnership of stakeholders-Feb.2017



# VINCENT WILDLIFE TRUST'S BAT RESERVES

- N=40 IN BRITAIN & IRELAND: EG PENCELLI  
DISUSED WATER MILL



# Biodiversity for Low and Zero Carbon Buildings:

## A Technical Guide for New Build

Dr Carol Williams  
of the Bat Conservation Trust

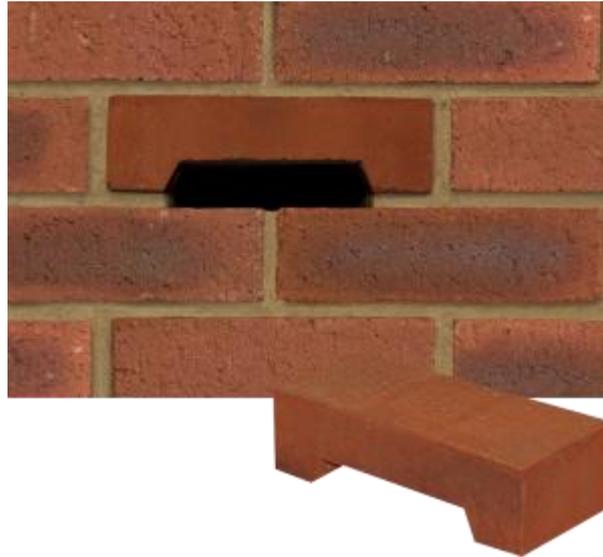


RIBA  Publishing

Bat Conservation Trust



# TILES & BRICKS



# PROVIDE ARTIFICIAL ROOSTS: BAT HOUSES



# ARTIFICIAL ROOSTS – BAT HOUSES

- SYSTEMATIC REVIEW – (NGOs, EUROBATs)
- TARGET: DEPLOY MORE (OF THOSE THAT WORK!)

# ARTIFICIAL HIBERNACULA

- HIGH LODGE, THETFORD FOREST, NORFOLK, UK
- 2004: Y-SHAPED TUNNEL -100M LONG - £40,000
- 2013: 62 BATS OF TWO SPECIES

# ARTIFICIAL HIBERNACULUM



Plate 1: Bat hibernaculum at Two-Mile Bottom, Thetford under construction in May 2004 (p. 2).



Plate 2: The same site in January 2012 (p. 8).

N. Gibbons

N. Gibbons

# ARTIFICIAL HIBERNACULUM: ALDRESHOT LAKE MITIGATION PROJECT



# ARTIFICIAL HIBERNACULUM: ALDRESHOT LAKE



# ARTIFICIAL HIBERNACULA

- TARGET: SYSTEMATIC REVIEW (EUROBATS & NGOs)

# BAT BRIDGES

- Cornwall, UK: “£27,000 per bat using it”



# BAT BRIDGES

- BALBIGNY, FRANCE



# GREEN BRIDGES

“£300,000 bridges will guide bats across HS2”



# BRIDGES

- TARGET: SYSTEMATIC REVIEW (EUROBATS & NGOs)

# TARGET

- **PROTECT AND MANAGE FORAGING AND ROOSTING HABITATS:**  
EG RELCOM'S CRITICAL AREAS FOR BAT CONSERVATION:
  1. AICOMs: (LARGER) AREAS OF IMPORTANCE FOR BAT CONSERVATION - FOR FORAGING & ROOSTING.  
N=70 IN 15 COUNTRIES
  2. SICOMs: (SMALLER) SITES OF IMPORTANCE FOR BAT CONSERVATION – CAVES, PARKS, WATER BODIES, BUILDINGS, BRIDGES, TUNNELS, ABANDONED MINES.  
N=17 IN 9 COUNTRIES

# POTENTIAL TARGETS

- BCI's SIGNIFICANT BAT AREAS (N=90 -100)
- IUCN's KEY BIODIVERSITY AREAS:  
DUPNISA (TURKEY):  
WINTER: 25,000 BATS  
SUMMER: 4,000  
MAXIMUM: 56,000  
EFFECTS OF TOURISM CONTROVERSIAL

# ROOSTING HABITS

## POTENTIAL TARGETS

- CAMBODIA: FUREY ET AL., 2016
  - SURVEYED 98 CAVES
  - 13 CAVES – 6.3M BATS OF 17 SPECIES
  - 8 CAVES >95% OF CAMBODIA'S *CHAEREPHON PLICATUS*.
  - EATS PESTS OF RICE
  - PREVENTS LOSS OF >2,300 TONS OF RICE ANNUALLY
  - PROTECTS RICE MEALS FOR >21,800 PEOPLE/YEAR
- SO TARGET IS TO PROTECT 8 CAVES.....

# ARE BATS SPECIAL AS CONSERVATION TARGETS?

- CAN A THOROUGH UNDERSTANDING OF BATS HELP US IN REFINING OUR CONSERVATION EFFORTS FOR THE TAXON? **YES**
- DO BATS REQUIRE DIFFERENT CONSERVATION APPROACHES TO OTHER MAMMALS OR VERTEBRATES IN GENERAL?  
**FORAGING AREAS: NO**  
**ROOSTS: YES**
- ARE BATS SUSCEPTIBLE OR RESILIENT TO ANTHROPOGENIC CHANGES?  
**SOME MORE SUSCEPTIBLE**  
**OTHERS MORE RESILIENT**

# TARGETS: SUMMARY

- WIND TURBINES: REDUCE IMPACT
- FOREST LOSS: SUSTAINABLE FORESTRY
- CLIMATE CHANGE: LANDSCAPE CONNECTIVITY
- FORAGING AREAS: PROTECT & MANAGE
- ROOSTING AGGREGATIONS: PROTECT & MANAGE
- SYNANTHROPES: PROTECT EXISTING ROOSTS AND PROVIDE ARTIFICIAL ROOSTS
- REVIEW PURPOSE-BUILT ARTIFICIAL HIBERNACULA & BRIDGES
- STOP SPENDING MONEY ON MITIGATION THAT DOES NOT WORK
- NEED MORE EVIDENCE-BASED CONSERVATION

# THANKS

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