#BESNetTrialogue

Potential bat ecosystem services

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WHAT WE DO

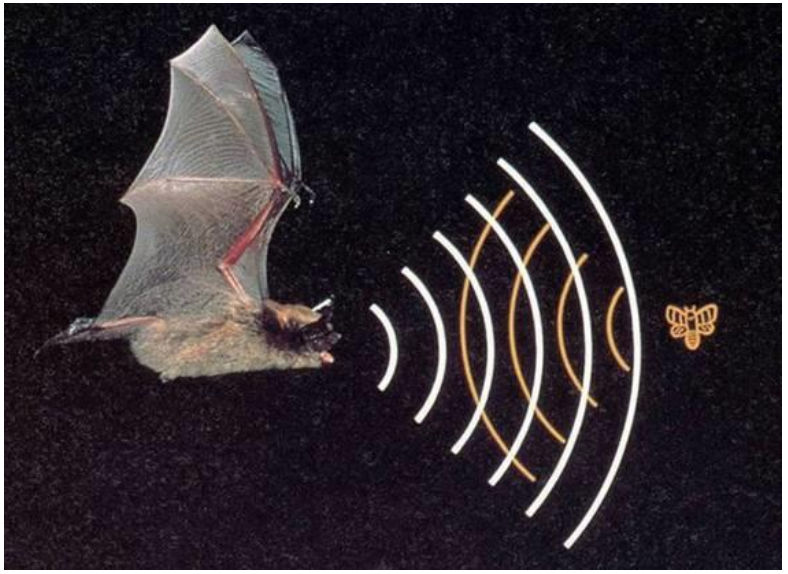
Conservation

Research

Capacity Building

Engagement

BAT DIVERSITY AND ECHOLOCATION



80+ species (120+ | 250+)

- 9 families
- 8 are mainly insectivorous









Fruit bats

- soft ripe fruits
- buds of flowers
- pollen / nectar
- some fruit bats feed only on pollen and nectar
- some feed only on nectar

- highly developed sense of smell and good eye sight

Other bats

- majority of prey are insects (hard and soft bodied, e.g. beetles and moths)
- arthropods (e.g. *Nycteris thebaica*)
- small vertebrates (e.g. *Nycteris grandis*)

THREATS TO BATS

human-bat conflict

roost disturbance (e.g. caves)

deforestation

roads

pesticides

CATS

roost destruction

persecution

habitat loss

climate change

white-nose syndrome

wind energy

hunting

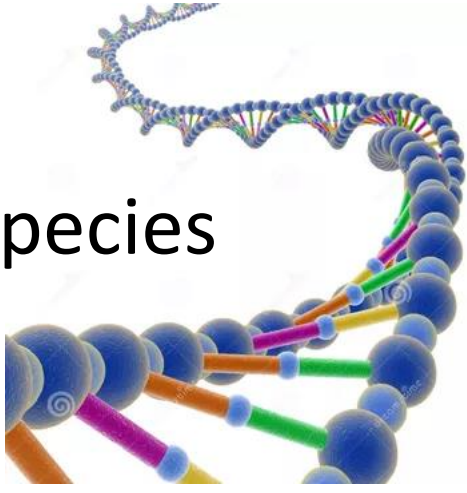
Africa

is largely a bat conservation void

According to Boyles *et al*. (2013): "*Bats are among the most economically important non-domesticated mammals in the world. They are well-known pollinators and seed dispersers, but crop pest suppression is probably the most valuable ecosystem service provided by bats*."

Also see Boyles *et al*. 2011 and Kunz *et al*. 2011

- Few studies
- Major predators of arthropods
- Difficult to quantify soft-bodied pest species



ECOSYSTEM SERVICE ESTIMATES

Data needed to understand value of bats:

- estimate of population size of bats in an area
- what prey species those bats are eating
- how many insects each species bats are eating
- effects of predation on insect populations

Some research to date has shown bats eating pests from:

- cabbage
- cotton
- coffee
- macadamia orchards (organic potential – Germany)
- maize (fall army worm??)
- soya bean
- sugar cane
- tobacco
- tea

Economic value of the pest control service provided by Brazilian free-tailed bats in south-central Texas

Cutler J Cleveland[1*], Margrit Betke[2], Paula Federico[3], Jeff D Frank[4], Thomas G Hallam[3], Jason Horn[5], Juan D López Jr[6], Gary F McCracken[3], Rodrigo A Medellín[7], Arnulfo Moreno-Valdez[8], Chris G Sansone[9], John K Westbrook[6], and Thomas H Kunz[5]

Brazilian free-tailed bats (*Tadarida brasiliensis*) form enormous summer breeding colonies, mostly in caves and under bridges, in south-central Texas and northern Mexico. Their prey includes several species of adult insects whose larvae are known to be important agricultural pests, including the corn earworm or cotton bollworm (*Helicoverpa zea*). We estimate the bats' value as pest control for cotton production in an eight-county region in south-central Texas. Our calculations show an annual value of $741 000 per year, with a range of $121 000–$1 725 000, compared to a $4.6–$6.4 million per year annual cotton harvest.

Front Ecol Environ 2006; 4(5): 238–243

POLICYFORUM

CONSERVATION

Economic Importance of Bats in Agriculture

Insectivorous bat populations, adversely impacted by white-nose syndrome and wind turbines, may be worth billions of dollars to North American agriculture.

Justin G. Boyles,[1]* Paul M. Cryan,[2] Gary F. McCracken,[3] Thomas H. Kunz[4]

White-nose syndrome (WNS) and the increased development of wind-power facilities are threatening populations of insectivorous bats in North America. Bats are voracious predators of nocturnal insects, including many crop and forest pests. We present here analyses suggesting that loss of bats in North America could lead to agricultural losses estimated at more than $3.7 billion/year. Urgent efforts are needed to educate the public and policy-makers about the ecological and economic importance of insectivorous bats and to provide practical conservation solutions.

Infectious Disease and Wind Turbines

Insectivorous bats suppress populations of nocturnal insects (*1*, *2*), but bats in North

At the same time, bats of several migratory tree-dwelling species are being killed in unprecedented numbers at wind turbines across the continent (*6*, *7*). Why these species are particularly susceptible to wind turbines remains a mystery, and several types of attraction have been hypothesized (*6*). There are no continental-scale monitoring programs for assessing wildlife fatalities at wind turbines, so the number of bats killed across the entire United States is difficult to assess. However, by 2020 an estimated 33,000 to 111,000 bats will be killed annually by wind turbines in the Mid-Atlantic Highlands alone (*7*). Obviously, mortality from these two factors is substantial and will likely have long-term cumulative impacts on both aquatic and terrestrial eco-

Economic Impact

Although much of the public and some policy-makers may view the precipitous decline of bats in North America as only of academic interest, the economic consequences of losing so many bats could be substantial. For example, a single colony of 150 big brown bats (*Eptesicus fuscus*) in Indiana has been estimated to eat nearly 1.3 million pest insects each year, possibly contributing to the disruption of population cycles of agricultural pests (*8*). Other estimates suggest that a single little brown bat can consume 4 to 8 g of insects each night during the active season (*9*, *10*), and when extrapolated to the one million bats estimated to have died from WNS, between 660 and 1320 metric tons of insects are no

US$3.7 billion/yr

Find text (⌘F)

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Contents lists available at ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser

Economic value of bat predation services – A review and new estimates from macadamia orchards

Peter John Taylor [a,b,*], Ingo Grass [c], Andries J. Alberts [d], Elsje Joubert [e], Teja Tscharntke [c]

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[c] Agroecology, Department of Crop Sciences, University of Göttingen, Grisebachstr. 6, 37077 Göttingen, Germany
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[e] South African Subtropical Growers' Association (Subtrop), Levubu, Office, Limpopo, South Africa

- SA damage ~ R50–200 million rand (US$3.6 – 15.3 million)

- Taylor *et al*. (2018) estimate bat ecosystem services from zero – US$757/ha/yr

Mexico – bat conservation innovative initiative

500+ plants pollinated by bats
(e.g. mango, banana, sausage tree, agave)

Bats are important seed dispersers and reforesters

COLLABORATORS

Professor Kirsty Park
University of Stirling

Professor Gareth Jones
University of Bristol

Dr Hugo Rebelo
CIBIO-InBIO (Portugal)

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