

OVER 50 MILLION YEARS AGO

ONE OF THE GREATEST ARMS RACES OF ALL TIME BEGAN

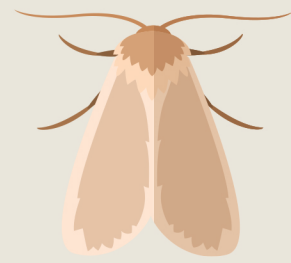
THE PREDATOR / PREY DYNAMICS BETWEEN MOTHS AND BATS REMAINS THE QUINTESSENTIAL EXAMPLE OF THE EVOLUTIONARY ARMS RACE – A CONTINUAL EVOLUTION AND ESCALATION OF COUNTERMEASURES BY BOTH SPECIES

SELECTION PRESSURE FROM INSECTIVOROUS BATS HAS DRIVEN THE DEVELOPMENT OF MULTIPLE ANTIPREDATOR STRATEGIES:

92,000

OF THE APPROXIMATELY 200,000 SPECIES OF LEPIDOPTERA, ABOUT ONE HALF BELONG TO FAMILIES THAT POSSESS EARS; ONLY SEVEN OF WHICH USE SOUND FOR SOCIAL COMMUNICATION

EVASIVE MANEUVERS



MOTHS' SENSITIVE EARS CAN DETECT AN APPROACHING BAT AT > 20M, WHEREAS BATS CANNOT DETECT MOTHS FURTHER THAN 5M

MOTHS REACT TO A DISTANT BAT BY SIMPLY ALTERING DIRECTION OR INCREASING THE UNPREDICTABILITY OF ITS FLIGHT PATH. A NEARBY BAT, HOWEVER, INDUCES A MORE DRAMATIC AND ERRATIC FLIGHT RESPONSE – THE EVASIVE BEHAVIOR MAY CONSIST OF:

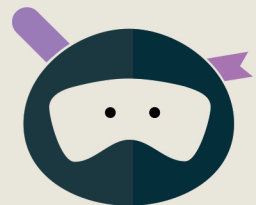


STARTLE SIGNALS



HAWKMOTHS ALTER FLIGHT SPEED ON HEARING ULTRASOUND AND SOME SPECIES RESPOND BY EMITTING ACOUSTIC SIGNALS THAT MAY STARTLE BATS

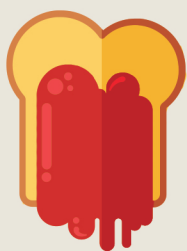
ADAPTIVE SILENCE



NON-AERIAL MALE LESSER WAX MOTHS AND BUSH KATYDIDS CEASE COURTSHIP SINGING TO AVOID DETECTION BY GLEANING BATS



JAMMING



BERTHOLDIA TRIGONA TIGER MOTHS ARE THE ONLY ANIMAL KNOWN TO DEFEND ITSELF BY JAMMING THE SONAR OF ITS PREDATORS

THEY PRODUCE NUMEROUS, DENSELY PACKED CLICKS CONTINUOUSLY FOR SEVERAL HUNDRED MILLISECONDS, DISRUPTING THE ACOUSTIC PROPERTIES OF ECHOES AND CAUSING AN IMPRECISE AWARENESS OF THE MOTH'S LOCATION

58%

"EARED" NOCTUID MOTHS DETECT THE ECHOLOLOCATION SIGNALS OF BATS IN TIME TO INITIATE EVASIVE FLIGHT MANEUVERS – A 29% TO 58% ADVANTAGE OVER MOTHS WITHOUT THIS SENSORY ABILITY

ULTRASOUND ABSORPTION



THE WINGS OF SOME SATURNIID MOTHS "ABSORB A LARGE PORTION OF THE SOUND ENERGY CONTAINED IN A BAT'S ULTRASONIC CRY; AS A RESULT, THE BAT RECEIVES A DAMPENED ECHO, AND THE MOTH BECOMES INVISIBLE TO THE BAT."