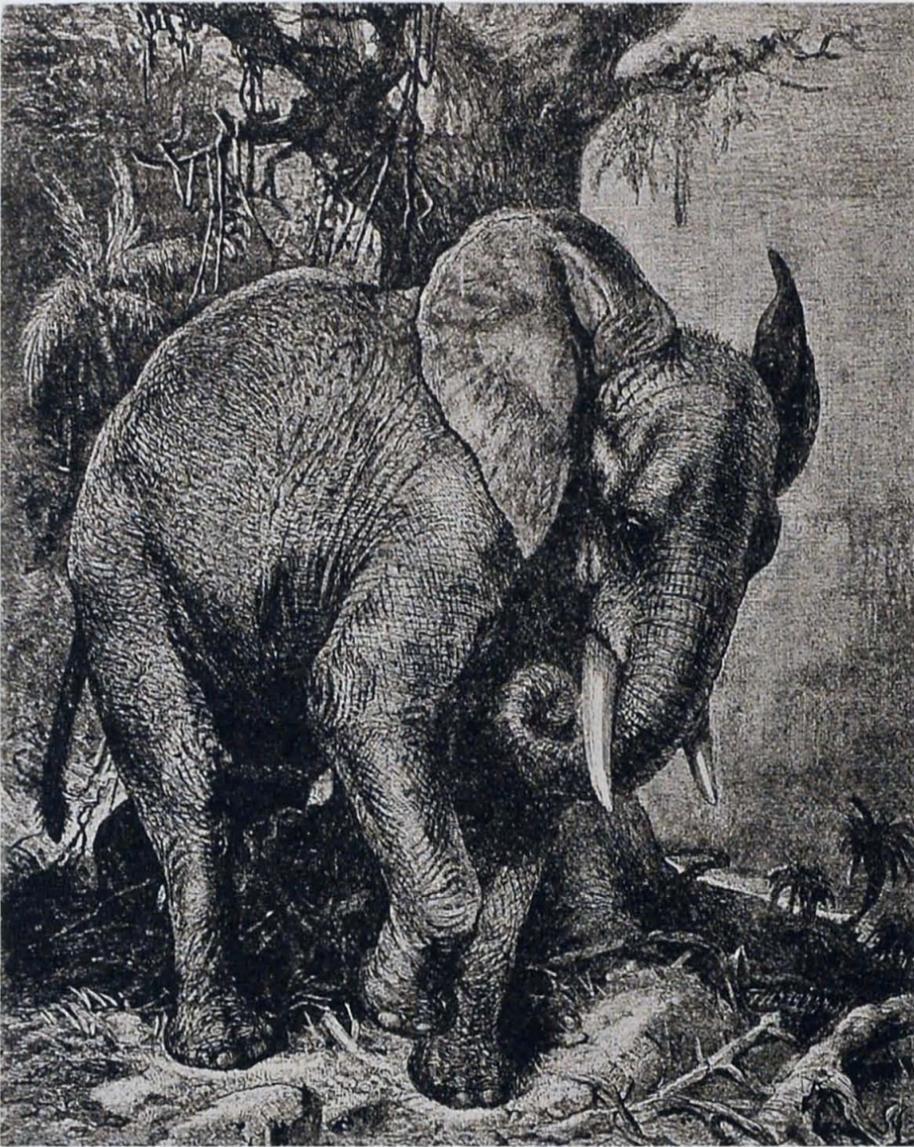




# Sanctuary Papers



## Elephants sing like humans to attract mates

Elephants communicate using a low-frequency infrasound rumble, inaudible to the human ear, to keep herds together and, as a new study finds, by males to attract mates as well. Experts had earlier speculated whether the elephant infrasound was created as a result of muscular twitching movements of the vocal cords, similar to a cat's purr.

However, a group of researchers from Germany found that these rumbles, on a frequency range below 20 Hz., have much in common with human singing and are produced in exactly the same manner – by air being blown through the larynx, a type of vocalisation known as myoelastic-aerodynamic or flow-driven mode. The researchers, who studied the larynx of a deceased African elephant bull at the Berlin zoo, wrote in the journal *Science*, “Although we can clearly rule out a role for active muscle twitching in our excised larynx preparation, we obviously cannot eliminate the possibility of such ‘purring’ in a living elephant. However, our study demonstrates that there is no need for such twitching to produce loud low-frequency vocalisations such as elephant rumbles.” As indicated by their research, “the low fundamental frequency of the produced sounds is directly related to the dimensions and tension of the vibrating tissue that

constitutes the elephant larynx, based on well understood physical principles.” This offers a physiologically and evolutionarily efficient means to produce the very intense low-frequency sounds used in elephant long-distance communication.

## Giant reef fish head-butt rivals for sex

Males of the green humphead parrotfish *Bolbometopon muricatum*, the largest species of parrotfish, have been observed displaying ramming behaviour when competing for females, according to a paper published by American researchers in the journal *PLoS ONE*.

Named for its prominent forehead ridge, further emphasised by a thick bony plate in males, the humphead parrotfish was earlier believed to use this headgear to break up coral reefs for feeding. However, experts had their doubts about the theory, as the fish already possess powerful jaws for feeding on the coral. The discovery was made by chance by Roldan Muñoz, a marine biologist with the U.S. National Marine Fisheries Service in Beaufort, North Carolina, and his team. In mammals like red deer and bighorn sheep, antlers and horns play a pivotal role in mate selection. Muñoz's theory is that the same is the case with male humpheads, who have larger forehead ridges than females. If this stands true, males who are more aggressive at head-butting and with larger forehead ridges should have a competitive edge over others when it comes to sexual selection. That's the question that needs to be answered, says Muñoz, whose team plans to study the behaviour in more detail. These fish, known to be shy around humans, can grow up to a weight of more than 75 kg. and can measure up to one and a half metres in length. David Bellwood, a marine ecologist at James Cook University in Townsville, Australia, though not involved in the study, said, “These really are underwater buffalos, gentle giants that play a critical role in coral reef ecology. But when reproduction is involved, it is time to fight.”

## Bigger the horn, better the health

For a male rhinoceros beetle, it has been found that bigger horns translate to better health. These horns vary in size, from tiny bumps to two-thirds of the length of the insect's body, a difference explained by a recent study published in *Science*, along with the causes of such extraordinary growth of horns in some cases. Led by Dr. Douglas Emlen from the University of Montana, U.S.A, the study found a link between the size of the horns and molecules that reflect how well-nourished they are. The team's findings also suggest that the horns are more sensitive to ‘nutritional signals’, which are changes in insulin owing to diet and immunity, than other body parts.

These insulin pathways also help in regulating tissue growth and body size. Beetles that are healthier have larger bodies and wings and have significantly larger horns as well. “If the horn cells are super sensitive to these nutrition signals, then the same mechanism that makes horns huge in high-quality, good condition males will also make horns especially tiny in low condition, poor-quality males,” Dr. Emlen told *BBC Nature*. Earlier, researchers had speculated as to whether the role played by the size of the horns in sexual selection could be deceiving, however Dr. Emlen and his team found the horns to be honest. The large forked horns cannot be produced by weak, unhealthy individuals as the size is directly linked to their insulin levels, which in turn is linked to their nutritional state.

## Male dragonflies change colour thanks to chemical reaction

Scientists have discovered the simple chemical reaction that causes segments of bright yellow dragonflies to turn vibrant scarlet each summer. A team of Japanese biologists has published the study in the journal *Proceedings of the National Academy of Sciences* and described both the pigments and mechanism behind this spectacular transformation. Lead author Ryo Futahashi, a biologist at Japan’s National Institute of Advanced Industrial Science and Technology, has been enticed by dragonflies ever since he was a child and explains that red dragonflies are of cultural significance in Japan and are a popular poetic symbol of autumn, as the timing of the colour-shift coincides with late summer. “Because dragonflies are diurnal [awake during the day] and have a better sense of vision than smell or sound, body colour is essential for partner recognition,” he said.

*Crocothemis* and *Sympetrum* were the two dragonfly genera studied by the team, the males of which transform from a sunny yellow to crimson. The colour-shift is referred to by biologists as ‘nuptial



colouration’ and takes place when a male reaches sexual maturity. Due to the transformation, yellow juveniles are not considered threatening by mature males. The study was conducted on specimens from six species. Scientists collected and analysed epidermis samples from the abdomens of the dragonflies and the colour source was identified as the ommochrome pigments, which are responsible for colour in many other insects and crustaceans. They then microinjected a solution of this pigment into a live dragonfly’s abdomen, in order to chemically induce the colour-shift, and discovered that the mechanism behind this change was a simple redox reaction. Futahashi explained that a redox reaction has been discovered for the first time as the cause of such a colour change in insects, although a similar process has already been observed in maturing fruit like tomatoes.

## Newly-discovered monkey flower could answer evolutionary mysteries

A new species of monkey flower, which is a hybrid between two foreign flowers, has been discovered in Scotland by researcher Mario Vallejo-Marin, a scientist at the University of Sterling. The study has been published in the journal *PhytoKeys*. The new species – *Mimulus peregrines*, cannot reproduce with any other variety and has a different size genome than other monkey flowers.

Most hybrids of this nature are sterile, but an astonishing and rare genetic duplication has allowed this species to evolve to become fertile. Hybrid flowers in general have an odd number of chromosomes or huge packets of DNA, making them sterile and unable to reproduce. This rare phenomenon has only been witnessed amongst a few wild plants. The exact sequence of events that led to the evolution of this new species is not known, however Vallejo-Marin intends to study it more closely. Wheat, cotton and tobacco are thought to have evolved in the same way ages ago and new insights into how these flowers have regained fertility could help resolve mysteries on the evolution of many other plants as well. “It provides an opportunity to study speciation as it happens – most species originated thousands of years ago,” said Vallejo-Marin. Monkey flowers get their name due to the shape of their blooms, which resembles the face of a monkey. The new species came into existence around 140 years ago, explained Vallejo-Marin. The ancestors of the flower were from the western United States and South America’s Andes and were sought out as botanical curiosities by Victorian gardeners in the 1800s. They were soon displaced from gardens and can now be found in the wild along streams and riverbanks.

## Sparrows decline as noise levels increase

A new study conducted by the University of Sheffield finds that soaring industrial and traffic noise levels in urban areas make it difficult for mother sparrows to hear their offspring, which in turn affects their communication, making the juveniles less likely to receive food. A long-term study that began in 2000 was conducted on sparrow populations in the Bristol Channel and on Lundy Island. The island produces its own electricity, enabling researchers to compare the behaviour of birds living beside the generators with those living