# BioS Reports

Glimpse into the activities of the
Master's course "Biology in Society"

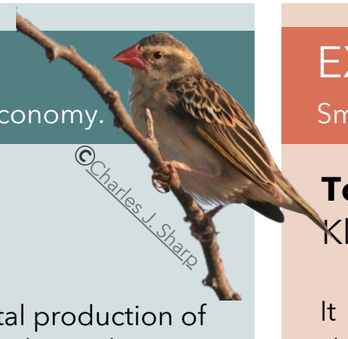
ISSUE 44

January 2026

ISSN 2940 - 4673


## ANIMALS AND MONEY

This part of BioS Reports unravels relationships between animals and the economy.




### Tiny Birds, Devastating Impacts: Queleas Cost African Agriculture 80 million USD Annually

Nnamdi Okpalaima

Cereal farming is one of the major agricultural activities in Africa. With a total production of 218 million tonnes in 2023, Africa contributes about 7% to the world's annual cereal output [1]. This number is remarkably low for a region in which cereals are the most widely cultivated crops. Among several factors, the red-billed Quelea (*Quelea quelea*), considered the most destructive grain-eating bird in Africa, contributes significantly to this productivity lack. These birds damage 15–20% of cereal crops annually, resulting in economic losses of approximately $79.4 million USD in Africa's semi-arid regions [2]. Queleas target nearly all cereal crops, avoiding only maize because of its large seed size [2]. They are distributed throughout sub-Saharan Africa, from Senegal to Ethiopia down to South Africa. With an estimated 1.5 billion breeding pairs, Queleas are among the most abundant bird species globally, exhibiting migratory patterns that are difficult to control [3].

Due to their enormous collective consumption capacity, these small birds are a serious threat to cereal farming. The average Quelea eats around 10 grams of grain per day [4]. In July 2022, The Food and Agriculture Organization of the United Nations (FAO) reported that an estimated 21 million Quelea invaded cereal farms in Tanzania [4]. Based on their consumption rate, this flock would have consumed roughly 210 tons of grain in a single day. Given an average cost of $365 USD per ton, this attack would have resulted in a daily loss of approximately $76,650 USD - equivalent to nearly one US dollar per second.

To mitigate these losses, farmers employ various non-chemical methods such as scarecrows, noise devices, and netting, but these measures are barely effective. Therefore, chemical control using organophosphate avicides like fenthion remains the most widely used strategy [5]. In 2022, approximately 62.9 million Quelea across 550 hectares were killed using fenthion in Ethiopia [6]. At a cost of $15 USD per liter of fenthion, this operation would have required around $16,500 USD. Given that Africa contains over 127 million hectares of cereal farmlands [7], spraying this entire area once would have cost an estimated $3.8 billion USD on the avicide alone. Consequently, many African governments allocate substantial funds for Quelea control programs. They also rely on international organizations like the FAO, which allocated $500,000 USD to Tanzania for emergency aerial spraying, surveillance, and alternative control strategies [4].

Beyond the economic burden, chemical control poses risks for non-target animals and potentially humans. Spraying large roosts results in mass poisoning of birds, and, in some cases, secondary poisoning of scavengers [8]. In Botswana, avicides are combined with explosives to destroy breeding colonies [5], a practice that may contribute to environmental degradation and biodiversity loss.

In conclusion, the economic importance of Quelea birds in African agriculture cannot be overemphasized. There is an urgent need to develop more effective and environment-friendly control strategies to ensure food security while safeguarding ecosystems.

## EXCURSIONS AND OTHER NEWS

Small insights in BioS points of view, field trips, and other stuff we do.

### Topics of the Master Theses by BioS Students

Klaus Reinhardt

It is now one year ago that at this place we published a list of topics that BioS students would be addressing during their thesis work [Issue 32]. Below is an update to indicate the breadth of topics chosen by students and so to give future BioS finishers an exciting insight into what can be done. Please note, data protection laws do not allow us to link the topics to names or to marks.

- Evaluation of Antibacterial and Antiviral Properties of Selected Flavonoids
- Inner Nuclear Membrane Protein Import during Premature Aging
- Genetic Analysis and Mapping of Resistance against Powdery Mil-Dew (*Podosphaera leucotricha* (Ellis & Everh)) in a Biparental F1-Population of the Wild Apple Species Malus baccata ‚Jackii'
- Constraint-Seeking Strategies in Non-Human Apes
- Acute and Repeated Restraint Stress-Induced Cellular Adaptations in the Murine Adrenal Cortex. Investigating Underlying Molecular Mechanisms Using in Vivo and in Vitro Studies
- To what Degree Do African Side-necked Turtles Differ? Initial Insights into the Proteome of their Secretory Glands
- Blow Flies in the Dresdener Heide – Molecular and Morphological Identification of Blow Flies (Diptera: Calliphoridae) with Notes on the Temporal Biodiversity of Forensically Important Species
- The Genetic Reevaluation of the Indian Black Turtle *Melanochelys thrijuga* in Sri Lanka
- Adaptation Mechanisms of the Brain Energy Metabolism during Cold Acclimation in Adult *Drosophila melanogaster*
- Ultrastructural Reconstruction and Analysis of k-Fibers in Monastrol-treated hTERT-RPE-1 Cells
- Molecular Species Identification and Species Delimitation of Deep Sea Isopods
- Deciphering the European Origin of North American Lumbricus (Annelida: Clitellata) species
- The Influence of Social Hierarchy on Sperm Metabolism in Nile Tilapia

## EXCURSIONS AND OTHER NEWS

### From BioS into Practice: Reflections from the One Health Conference in Zambia

Rodrigo Fernando Calderon Barrientos


What happens to biological knowledge once it leaves the university? How does it move from research into systems that shape our health, food security and sustainability? During my Master's program Biology in Society, these recurring questions drove many discussions. Not knowing at the time, the module "Economically Important Animals" led me to an answer. It was there that I first encountered the Black Soldier Fly - an insect capable of converting organic residues into biomass with remarkable efficiency. Back then, it left me puzzled why such a biologically elegant system was still marginal in mainstream agriculture, despite its clear potential for sustainability.
After completing the BioS program, my search for work at the intersection of biology, sustainability, and real-world impact eventually led me to REPLOID, a circular economy company specialized in insect bioconversion. As with the Black Soldier Fly, this process relies on insects to transform organic waste into products like protein, fat, and fertilizer. My role at REPLOID involves researching and optimising the bioconversion process. This background framed my participation in the Regional One Health Conference for Eastern and Southern Africa in Lusaka, Zambia, where I represented REPLOID within the innovation marketplace and the "Feed to Food" session. The conference brought together politicians, researchers, economists, and practitioners to discuss how the One Health objective—ensuring human, animal, and environmental health—can be turned into action locally.

Across the sessions, a clear narrative emerged. One Health is understood as a foundation for long-term resilience: stabilizing food systems, reducing dependency on imports, protecting ecosystems, and creating local economic opportunities. REPLOID's contribution to this discussion lies in industrial insect bioconversion. Using Black Soldier Fly larvae, local bioconversion units transform organic residues into three outputs essential for agriculture: insect protein for feed, insect lipids, and insect frass, an organic fertilizer. Instead of residues accumulating in landfills or posing sanitation risks, they are transformed within days into valuable agricultural resources. This approach directly addresses challenges shared by many regions represented at the conference: unmanaged organic waste, rising feed costs, degraded soils, and strong dependence on imported feed and fertilizers. In this context, local protein and fertilizer production is not just an environmental benefit, but a matter of economic and food security. However, the technology alone is not sufficient. Contributions from Asia, including Korea's insect industry, demonstrated how long-term government leadership, science-based approval systems, farmer training, and public engagement can support insect-based systems at scale. These examples echoed a key BioS insight: biological solutions can only succeed when they match institutions, culture and economics.

Leaving Lusaka, I was struck by how closely the conference outcomes aligned with the questions that first drew me to Biology in Society. Like BioS, One Health highlights how embedding biological knowledge in societal systems is key to achieving real impact. For me, the Black Soldier Fly—once a small case study in a university module—has become a concrete example of how biology can contribute to food security, environmental protection, and economic resilience.
For biology students, this trajectory offers a clear lesson. The impact of our discipline does not end with research results. It continues in how we apply this biological knowledge to shape society in a meaningful way.


Published by the Master's course Biology in Society | edited by Simon Schäfer, Philine Hampe, Patience Dodgson, Marit Scheuringer, Hana Abdeljalil | v.i.S.d.P. Klaus Reinhardt | ISSN 2940 - 4673


Follow us on Instagram! @biosreports
or Spotify @Science Unpacked: The BioS Podcast