



ANIMALS AND MONEY

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

Spruce Bark Beetles: The Silent Invader of German Forests

Arezou Aminizadeh



The silent infestation of a tiny beetle is turning Germany's green forests into graveyards, giving rise to an alarming environmental crisis. All over the world, forests provide a home to over 50% of terrestrial species and combat climate by carbon sequestration, resulting in a reduction of greenhouse gases and preventing temperatures from rising [1]. They also regulate water levels, prevent erosion and can even lower blood pressure and stress of some animals [2]. The role of forests in achieving a sustainable future in the context of limiting global warming to 1.5°C is important. This goal can be achieved by halting deforestation and strengthening forest management and reforestation efforts [1].

Forests cover up to one third of Germany's territory, which amounts to 11.4 million hectares with more than 90 billion trees. These forests are roughly balanced between deciduous and coniferous trees, with conifers like spruce and pine making up a slightly higher proportion at 54.2%. Spruce (*Picea abies*) is the most common species at 25.4% [2]. Forests face an ever-changing environment, leading to adaptations or - in the worst case - a loss of valuable forest territory. Unfortunately, forest loss in Germany is much higher than previously thought [3].

In German forests, the Bark Beetle (*Ips typographus*) is a secondary pest, attacking mainly weakened or dying spruce trees, one of the most important woods in the European timber industry. The drought-weakened spruce is especially vulnerable to beetle infestation. Climate change is making this worse by increasing beetle outbreaks, often causing widespread devastation, even to healthy trees [4, 5]. Beetle attacks also introduce fungi into the trees, causing significant damage to the wood's physical and mechanical properties like strength, elasticity, coloration, and weight over time [6, 7]. The beetle population's sex ratio is typically 50% [8], however, during outbreaks the proportion of females can rise to 72%. More females in the population allows for a more rapid rise in reproduction, leading to more destruction in a short amount of time.

In Europe, the annual dieback of spruce caused by the European spruce bark beetle increased dramatically from 2-14 million cubic meters to 118 million cubic meters in 2019, mainly due to dry and hot summers [9]. Researchers at the German Aerospace Center (DLR) used satellites and discovered that from January 2018 to April 2021 about 501,000 hectares forests have been destroyed in Germany. This is almost 5% of the total forest area and considerably more than previously estimated [3]. In 2019, Germany harvested 83 to 85 million cubic meters of wood, including hardwood logs. Over 80% of this harvest was damaged coniferous wood, which had to be sold at a discount [10]. Spruce logs traded mostly between 105 and 110 euros per cubic meter, while beetle-damaged wood was selling 25-30 euro less [11]. Taking into consideration that 68 million cubic meters of wood were selling at 80 euro and only 17 million cubic meters of wood at full price, an overall loss of 2 billion euro can be calculated for the year 2019. Climate change scenarios suggest that damage from wind, bark beetles, and forest fires will continue to rise with an estimated increase of 0.91 million cubic meters of timber lost per year by 2030 [12]. To counteract this damage, Germany would need to reforest the affected areas and convert the remaining forests at a rate of 95,000 hectares per year, potentially costing up to €43 billion by 2050 [13].

Despite current high exports of softwood lumber, Europe may face local supply shortages in the future due to early harvesting caused by bark beetle damage. European sawmills are reaching capacity and exports of processed wood products are expected to decrease. As European supplies of logs decline, the United States may regain its share of exports to China and continue to supply European countries until their forests recover [14].

EXCURSIONS AND OTHER NEWS

Small insights in student's or professor's points of view, field trips, and other stuff we do.

Who Joins Biology in Society in 2024?

Klaus Reinhardt

Application stage	Number	From Abroad	Identify as Female
Applications	106	83%	69%
Interview invitations	61	72%	82%
Acceptance	37	54%	81%
Starting	21	48%	85%

BioS received 106 applications from 24 countries, most from India (27), Germany (17), Pakistan (14), Iran (9), and Egypt (7). Thirteen countries provided only one applicant. The large number of people writing no - or inadequate - motivation letters was disheartening, given that the emphasis we have placed on its importance in BioSReports [1, 2], as well as the statement on our website [3].

Two full days of interviews by Prof. Zierau, myself and Cosima Sagurna, a final-year BioS student, revealed that a surprisingly large number of the interviewees knew little about the topics taught in BioS, which is something that we look for in a candidate.

None of the 46 candidates from India, Pakistan and Bangladesh made it to the course. This was likely a major contribution to why we saw a decreasing representation of international students at every step of the application process. For example, 20% fewer applicants from this than other regions had an appropriate motivation letter. Two candidates were not able to join for a bureaucratic reason. With Kenya, South Korea, Taiwan, the UK, and Ukraine we were able to welcome students from five countries that were new on our list. Applicants via uni-assist generally seem not aware that we get to see all of their applications, not just the one to BioS. This generates a bias against students from Germany from which we do not have that information.

In the end, 37 candidates showed the special suitability required for BioS and were invited to join BioS, corresponding to an acceptance rate of 35%. The 2024 cohort now consists of 21 people.

EXCURSIONS AND OTHER NEWS

The Second Cohort of BioS Congratulates Their First Graduate!

Rodrigo Fernando Calderón Barrientos

Biology in Society is still quite new as a master's program, so it is an exciting milestone to celebrate when the second cohort has its first graduated student. Rodrigo started this master's in 2022, and with a lot of hard work and diligent time management, he has officially graduated!

During my lab rotations, I was drawn to the Environmental Monitoring and Endocrinology (EME) work group at the Technische Universität Dresden, where I ultimately completed my master's thesis. The lab's focus was on detecting, testing, and analyzing substances in the environment, especially endocrine-active or endocrine-disrupting compounds. These substances include certain drugs and banned doping agents: areas that have a significant impact on both environmental and human health. I found this research particularly fascinating! My rotation allowed me to explore the biological effects of anabolic-androgenic steroids (AAS), specifically testosterone and its derivatives. This quickly became a key area of focus for me. The lab's open-minded approach to research and its support for innovative ideas convinced me to stay for my thesis. Additionally, the expertise of my supervisor, Dr. Annkathrin Keiler, combined with the collaboration with Freie Universität Berlin, made the decision an easy one.

Coordinating between the two labs—one in Berlin and one in Dresden—was challenging. It required careful planning and constant communication, as the mass spectrometric analyses were conducted in Berlin, while the histological work took place in Dresden. Juggling these two locations meant frequent travel and the need to stay meticulously organized, but it provided invaluable experience! Managing a complex, multi-site research project allowed me to gain exposure to a range of methodologies and expertise, enriching my overall research.

The master's program prepared me well for this work. From courses in advanced molecular biology to workshops on scientific writing and project management, I was equipped with both technical skills and theoretical knowledge. The practical lab rotations, especially those in histology and mass spectrometry, gave me the confidence to tackle the challenges I faced during my thesis.

Now that I have completed the program, I feel a mixture of pride and relief: it's been a long and challenging journey, but the sense of accomplishment is incredibly rewarding!

